Consulting Engineer

May 1961

Photo by Fabian Bachrach

L. M VAN DOREN, chairman of the National Society of Professional Engineers functional section for engineers in private practice, is against busy work, low dues, and organizational flag waving. He is in favor of private enterprise and states rights. Van Doren, of Servis, Van Doren & Hazard, Topeka, Kansas, also is against fence sitting. "For years I have heard people say that engineers should stay out of politics—particularly partisan politics. Personally, I think it would be refreshing not to have engineers always on the outside looking in while our political future is decided."

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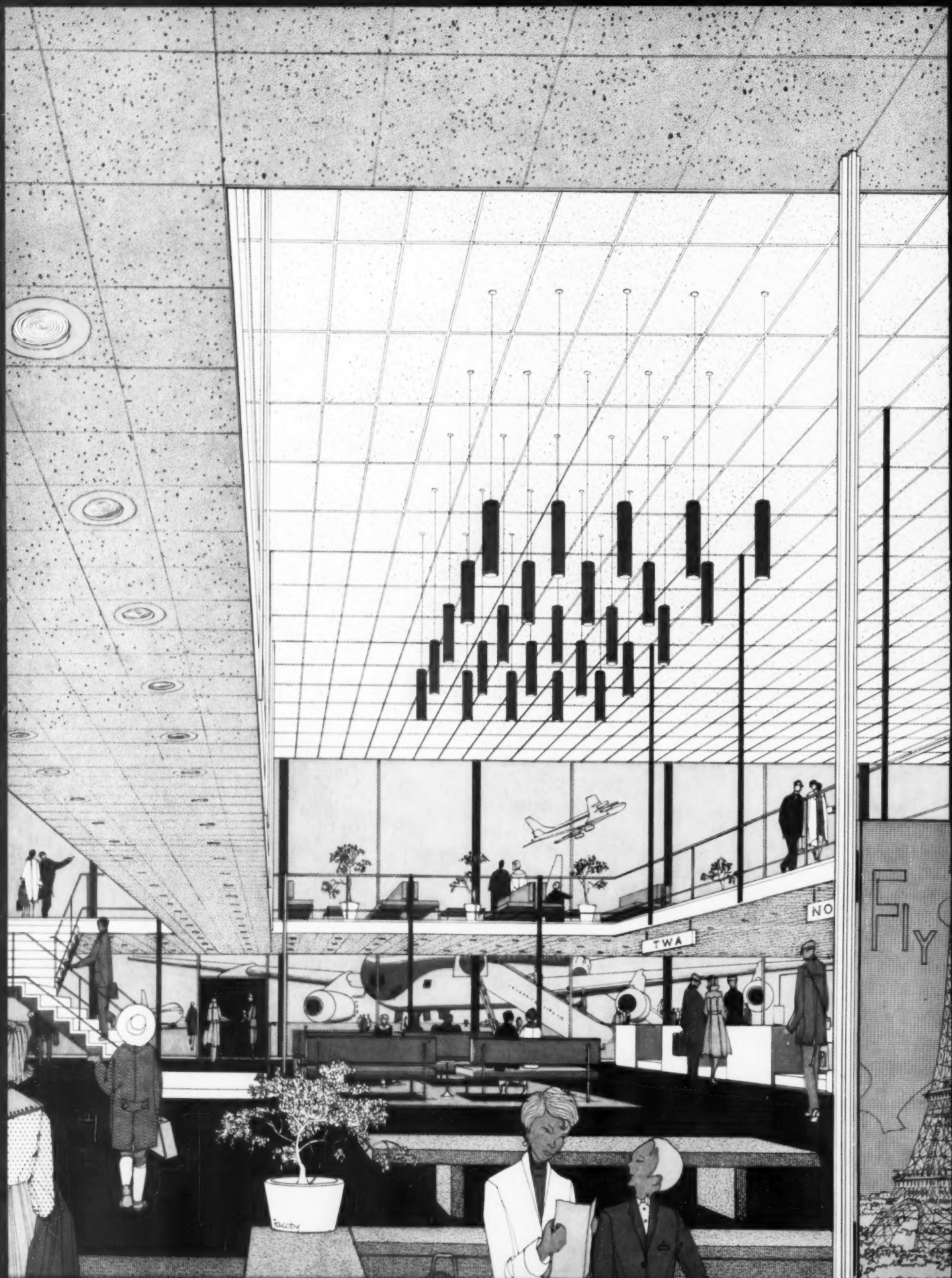
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How Armstrong Acoustical Fire Guard can save you up to two months' construction time

The large ceiling of the airline terminal on the left features the new Armstrong Acoustical Fire Guard *lay-in* system. This revolutionary ceiling system combines, for the first time, the economy and fast installation advantages of an exposed grid system with the protection of a time-design-rated ceiling.

The smaller lounge ceiling which you see just below the mezzanine is of Acoustical Fire Guard *tile*. Millions of feet of this tile have been installed since it was first introduced two years ago.

In either form, Armstrong Acoustical Fire Guard can save up to *two months'* construction time. Here's why.

Since Armstrong Acoustical Fire Guard is fully approved by the Underwriters' Laboratories, Inc., there's no need to install intermediate protection between the acoustical ceiling and the steel structural members.

Installation is a completely *dry* operation that does not require an extensive cleanup.

There are none of the other inconveniences and delays of a wet operation. Carpenters, painters, and flooring contractors can be on the job at the same time as the acoustical contractor. This alone can save weeks.

The Armstrong Acoustical Fire Guard lay-in units are available in both the Classic and Fissured designs. There are two nominal sizes: 24″ x 24″ x ⅝″ and 24″ x 48″ x ⅝″.

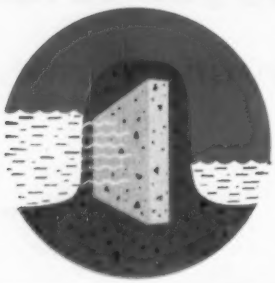
For information about either Acoustical Fire Guard tile or lay-in units, call your Armstrong Acoustical Contractor (he's in the Yellow Pages under "Acoustical Ceilings") or your nearest Armstrong District Office. Or write to Armstrong Cork Company, 4205 Park Avenue, Lancaster, Pennsylvania.

Armstrong ACOUSTICAL CEILINGS

First in fire-retardant acoustical ceilings

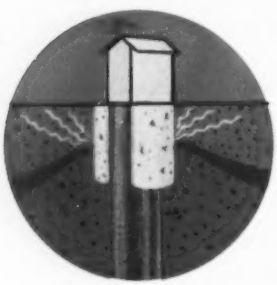
Architectural design and
rendering by Helmut Jacoby

HOW HALLIBURTON GROUTING VERSATILITY SOLVED THESE PROBLEMS



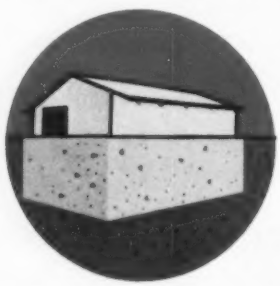
WATER RESERVOIR LEAKAGE

Irvine, Ky. – A reservoir adjacent to the Kentucky River was losing considerable water through permeable stratum beneath the reservoir dam. SOLUTION: Halliburton Pressure Grouting Service was engaged to build a cutoff "wall" through the permeable stratum. Grouting holes were drilled into the permeable stratum. Halliburton DOC (Diesel Oil Cement) grout was selected because of its ability to set almost immediately when contacted by water. Water leakage from the reservoir was completely halted.



SALT MINE WATER INTRUSION

Avery Island, La. – The wall of this 15′ x 20′ ventilation and access shaft, 508′ deep, is formed of open salt except for a concrete caisson lining the top thirty feet. Water had dissolved the salt behind the concrete at the caisson base, allowing water intrusion into the shaft. The water was dissolving and eroding the walls all the way to the mine floor. SOLUTION: Halliburton studied the problem and simulated these subsurface conditions for a long series of experimental injection tests prior to presenting a grouting plan for approval. It was decided to inject Halliburton Bloxall chemical grout at unusually low pressures and volumes to effect a water-tight seal between the salt dome and overburden without adversely affecting the salt, and to consolidate the fine water-bearing sand surrounding the shaft. Two concentric perimeters of grouting holes were drilled around the shaft. Pipe was placed in the holes and perforated at carefully selected depths with Halliburton's perforating tool. Accurate injection pressures were maintained at exacting levels by Halliburton's versatile six-plunger grouting pump. Pressure tests and observation after the job determined that the shaft was dry following this treatment and indicated that the surrounding formation was consolidated.



COMPRESSOR STATION VIBRATION

Wichita, Kan. – Excessive vibration in this compressor station building and surrounding area was apparently being caused by harmonic action of the compressors plus the inability of loose sand underlying the foundation to adequately anchor the structure. SOLUTION: A pattern of grouting holes were drilled through the floor of the building and into the unconsolidated sand formation. Halliburton Chemical grout was selected because it was necessary to actually penetrate the pore spaces of the loose sand. Following the chemical grout placement through perforations, the loose sand was consolidated and tied together, thus eliminating the damaging effects of vibration on equipment and protecting gas lines leading into the building.

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CONSULTING ENGINEER is published monthly by R. W. Roe and Partners at 217 Wayne Street, Saint Joseph, Michigan. Price 1 year $10.00; foreign $15.00; single copy $1.00. Accepted as Controlled Circulation Publication at Saint Joseph, Michigan.

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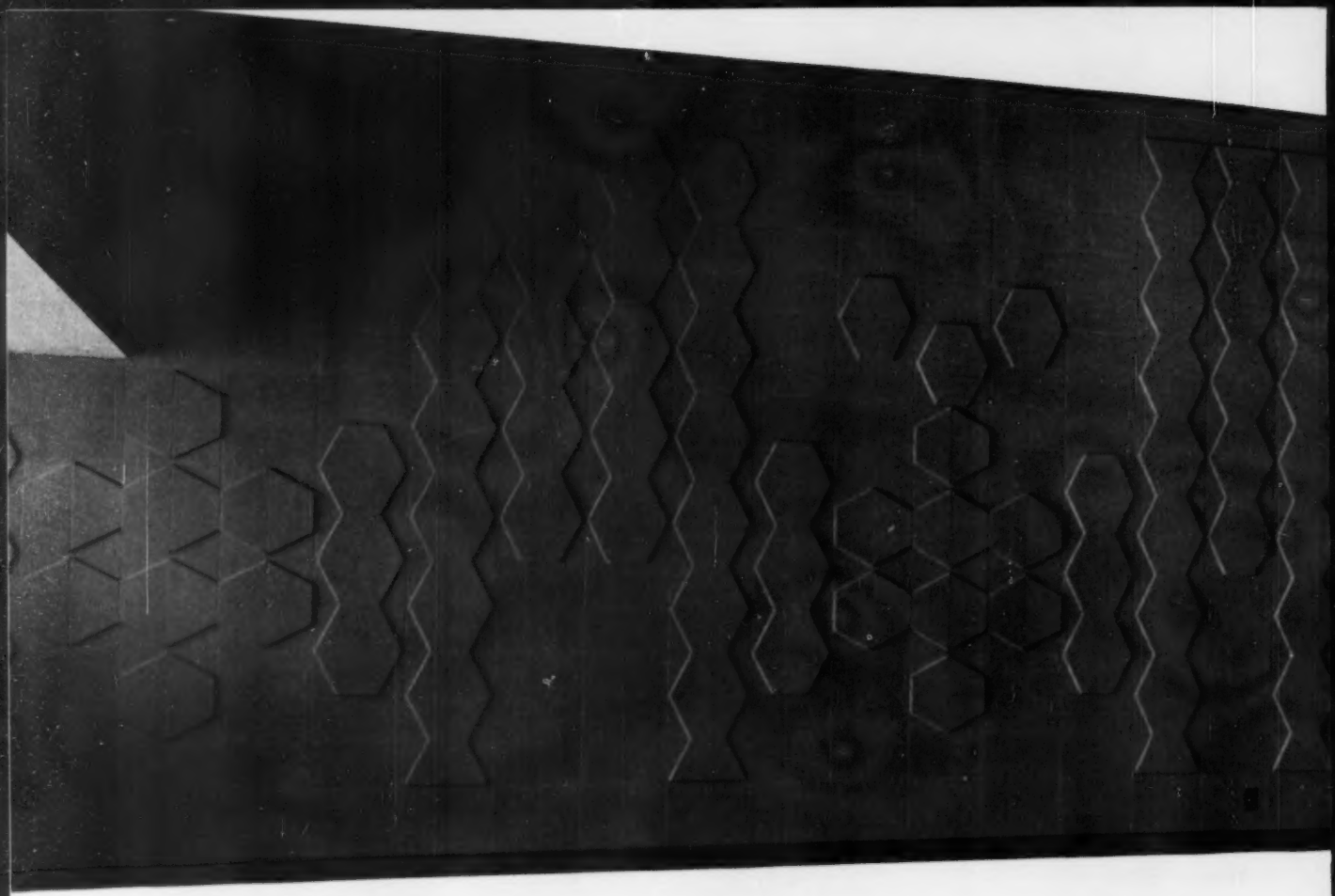

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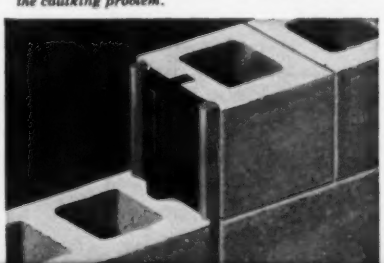

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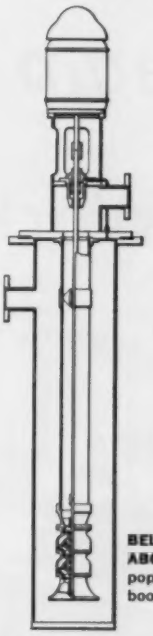

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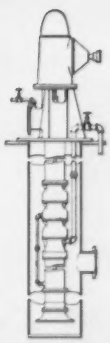

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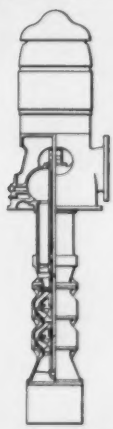

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Imaginative Engineering Puts to Work on *DAYLIGHT*

Mike Best and Ed Kralovec, mechanical engineers on the Madonna school, shown discussing job details with two of their colleagues.

Kralovec & Best, consulting engineers, went one step further in their heat and ventilation design for the new Madonna High School, Chicago — they applied pneumatic control to skylight louvers.

To meet the lighting requirements of the combination auditorium-gymnasium, architect C. I. Krajewski used a system of sky domes equipped with adjustable light dampers. How to control the dampers quickly and efficiently for change-over from plenty of daylight for gym activities to total blackout for movies, etc., was the problem presented to the consulting engineer.

Kralovec & Best's solution was — twenty-nine 4-inch powerstroke piston damper motors — one for each of

Sky domes, inside and out. Each contains a set of light dampers, all of which operate simultaneously when darkness for movie showings is desired in the combination auditorium-gymnasium.

Powers Pneumatic Control

MADONNA HIGH SCHOOL
Chicago, Ill.

Architect: C. I. Krajewski, Chicago
Consulting Engineers:
Kralovec & Best
Chicago
Heating Contractor:
Windsor Heating Co.
Chicago

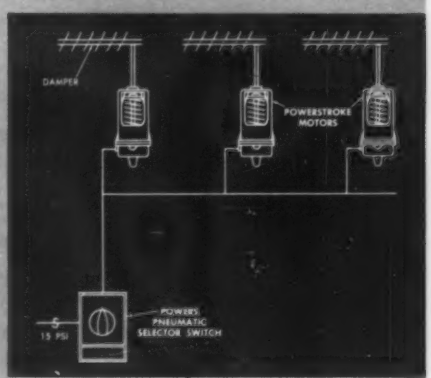
the sky dome louvers on the roof — energized instantly from a single Powers pneumatic selector switch in the projection room. Turning the switch activates air pressure at 15 psi. through a Powers Series 500 Pilot Valve to the motors to close the light louvers. When the switch is turned off, pressure is released . . . and the louvers swing open to admit light.

Pneumatic control of daylight in Madonna school is fast, easy and quiet — a definite convenience for the projectionist or instructors, an operational bargain for the school, maintenance-wise.

The complete heating system, as specified by Kralovec & Best, includes two hot water converters controlled at fixed temperatures. Individual classrooms are heated and ventilated by unit ventilators, controlled on the standard day-night cycle. Corridors, rest rooms, storage and locker rooms employ direct radiation controlled by Powers Day-Night room thermostats. For extra safety and comfort, hot water to all showers is controlled by means of a Powers Hydroguard Thermostatic Shower Control.

Here, then, is how imaginative engineering applied to pneumatic control can have unusual — but practical — results in an efficient, low cost system.

A single pneumatic selector switch in the projection room actuates 29 sets of light louvers through 29 individual powerstroke motors.



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L. M. VAN DOREN

– Starts on front cover

Large engineering societies and associations, Van Doren believes, are like big government. They tend to become overly involved with a myriad of little problems which can and should be solved by individuals and local organizations. "Organizations often get so busy chopping at bushes that they fail to see the umbrella of big trees that is inhibiting healthy growth in the whole forest," Van Doren added. "Also, as with big government, individuals in big organizations begin to expect personal assistance and services."

One of the country's most effective consulting engineering organizations is the functional section of the Kansas Engineering Society. Van Doren readily admits that his attitude toward the organization of consulting engineers within the framework of a state society of NSPE is largely a result of his experience with this Kansas group. He does not presume to advise what might be most effective in other states.

The Kansas Approach

"In Kansas, we decided in favor of action, rather than sitting around worrying about whom we might alienate. We feel that we owe apology to no one so long as we can prove that our programs are in the best interest of the public, our clients, and all truly professional engineers – regardless of their present employment. We find that considerable education of some of the latter group is required – particularly with respect to how demand and competition for their personal services from several sources affects their economic status.

"First, we realized that to do anything right we must have competent help, and that our major investment should be for the services of a well qualified, full time secretary-manager. The man we hired is both an engineer and an attorney. Although we rely greatly on his legal, legislative, and public relations abilities, his engineering background gives him an intimate understanding of our problems.

"In Kansas we spend about $7000 a year policing ethics. We concentrate on what we call primary ethics – matters involving responsibility of the engineer to provide completely adequate professional services to the client. We believe that we must first concentrate on cleaning our own house. In our terminology, secondary matters are those involving controversies between engineers. These become primary when they eventually lead to inferior services to clients.

"We are concerned only with complaints in writing, accompanied by substantiating evidence. Investigations are made by the secretary-manager and the ethics committee, depositions are taken, and a formal but confidential hearing is held when justified. When matters are settled in committee to the satisfaction of all, the findings are given only to those immediately concerned. In violations of law, findings and recommendations are forwarded directly to the State Attorney General or the State Board of Registration, as warranted. Findings involving only rules of ethics of an engineering society to which the man belongs are forwarded to that particular society with recommendations for further action. All of this must be done thoroughly, carefully, and confidentially to prevent unnecessary damage to reputations and resulting countersuits, and to provide well developed facts for final action by those in authority.

"In our experience, it has not been difficult to obtain written complaints from lay clients or other consulting engineers, but publicly employed engineers are reticent in these matters. We hope to convince them that we much prefer the written complaint to the whispering campaign.

"The whispering campaign about inadequate work of engineers in private practice is most difficult to combat. Several years ago the Kansas Engineering Society appointed a Board of Experts made up of some of the best engineers in the Society in the various specialties of practice. When a public official having approval authority and an engineer in private practice cannot agree upon the adequacy of plans prepared by that engineer, we suggest that they both agree to submit those plans to the Board of Experts for an unbiased opinion. This serves several good purposes. If the plans are inadequate, the engineer probably will not agree to the test and usually will fulfill his obligations without further argument. If the reviewing authority has no justifiable complaint or has simply been trying to impose personal preferences, he is likely to drop the matter. The simple fact of the Board of Experts existence along with a good ethics committee, both ready to serve, seems to have considerable effect in reducing both careless work and unjustifiable and damaging criticism.

Handling Other Problems

"Telephone listings is another example of a problem that can be handled best at the state or local level. We have had no difficulty with the telephone companies in setting up acceptable listings in the larger cities. This resulted in the elimination of a large number of firm names from the classifications in the directories where those firms were misrepresenting themselves. Continuous good relations with the telephone companies, of course, is necessary.

"Other activities in which only strong and active state and local organizations can be truly effective include: state legislative efforts, improvement of relations and contractual arrangements with architects, reasonable fee schedules as related to various types of work and scope of service, improvement of

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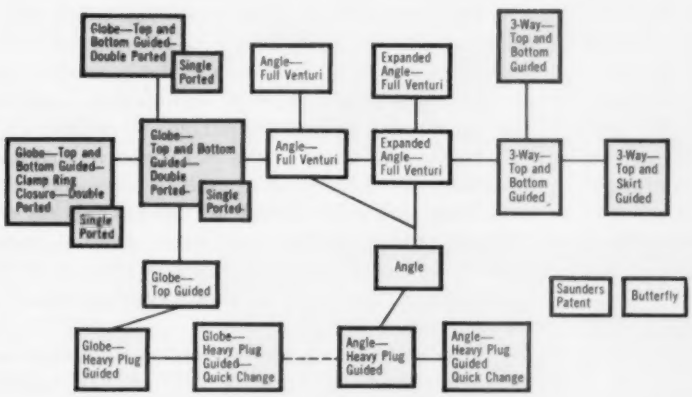

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relations with state and local agencies and their engineers, joint efforts with associations representing contractors, public relations, and employer-employee relations. Our Kansas group has been aggressive in all of these activities – and more. We have much to learn and have made some mistakes, but we feel that we have made considerable progress.

"In Kansas we collect approximately $26,000 a year by special assessments from 53 firms. The assessments vary, as determined by a formula in which man-hours and number of principals are the critical factors. Our major investment is in our highly qualified secretary-manager and his secretary, and we keep overhead and paper work to a minimum.

"I believe that any national organization should concentrate its efforts on matters national in scope which require coordinated and combined efforts for accomplishment, such as Federal legislation, policies, and procedures. But these efforts also require continuously active support at grass roots levels."

NSPE or CEC

Van Doren is not overly concerned whether consulting engineering organizations work through NSPE, Consulting Engineers Council, or both, as long as the men are willing to work hard and pay the necessary dues. He was asked if the functional section in Kansas has been hindered in any way by being within NSPE, where consultants are considerably outnumbered.

"If we had not been able to operate effectively, we would have reorganized in some other manner. We have had no trouble. Occasionally situations arise where the work might be carried on more pleasantly by a separate organization, where all members were in complete agreement, but we question whether we could be as effective. Some of our major problems involve differences in thinking and lack of communication and understanding between engineers in private practice and other professional engineers. We find that these matters must be faced squarely and in a mature manner when various interests are strongly represented within one organization.

"Only consulting engineers who make their living in private practice are eligible for membership in the Kansas functional section. Voting privileges on matters affecting raising and spending of funds are limited to owners and partners of firms who contribute to the special assessments.

"The general meetings are open, and we particularly encourage our employees to attend. I disagree with some who contend that consulting engineers cannot discuss their real problems in front of their employees. Our key employees are our best salesmen when they understand everything that is going on. Even with encouragement, only a few leading employees bother to attend the meetings – and they are the ones who probably will be in business for themselves eventually. The many meetings of the executive committee, standing committees, and special committees are closed meetings, except for special invitations.

"Our open meetings are sometimes attended by representatives of the American Institute of Architects, the Associated General Contractors, City Managers Association, County Engineers Association, and leading engineers of several of the state and Federal agencies. They often participate in portions of our program. When we invite their suggestions and criticisms, we find it easier to reach mutual understandings. It helps in improving some of our services and also results in opportunities for us to participate in a similar manner at some of their meetings."

Role of the Consultant

Van Doren gained considerable national attention as chairman of a committee which gathered information on engineering costs for a large variety of projects, including highway construction. The resulting report, "The Role of the Consulting Engineer in Federal Public Works Projects," was published by the NSPE functional section for use in combating irrational criticism of the use of engineers in private practice. Van Doren recognizes that the natural tendency of governmental agencies to try to build up their own engineering organizations is one of the most critical situations faced by consulting engineers. He also believes that large government engineering staffs would be just as damaging to all other engineers, and would make the whole profession less attractive to embryo engineers.

When actions of the functional section on this particular activity are questioned by NSPE members who resent criticism of government, Van Doren refers the questioners to NSPE Policy 33, wherein the Society expresses itself in opposition to the nationalization of any professional service, as economically unsound and detrimental to both the public and engineers.

"I believe that many of the NSPE policies are very reasonable as they affect consulting engineers. But consultants are often timid about standing up for them, particularly if they fear that such action might alienate a possible client – which is sometimes the result. A man must make his choice between principle and temporary expediency.

"A current and very controversial item among consulting engineers concerns the new model registration law adopted by NCSBEE. Personally, I am very much against its provision for unlimited corporate practice, and believe it unfortunate that NSPE gave its blessing to that particular clause. Those of us in the minority on this matter wish to point out that this is purely a state's rights matter. Well organized action can be effective in any state where this feature is considered undesirable. Proponents of this type of

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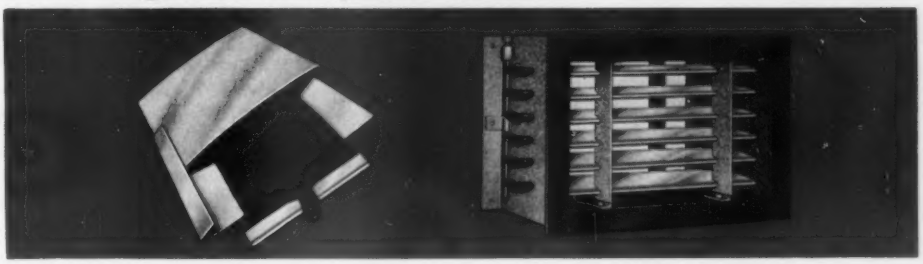

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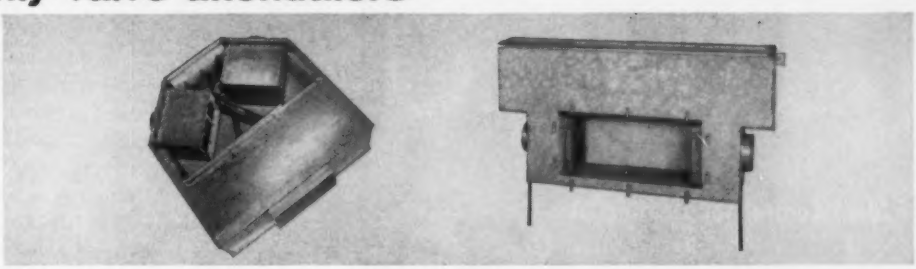
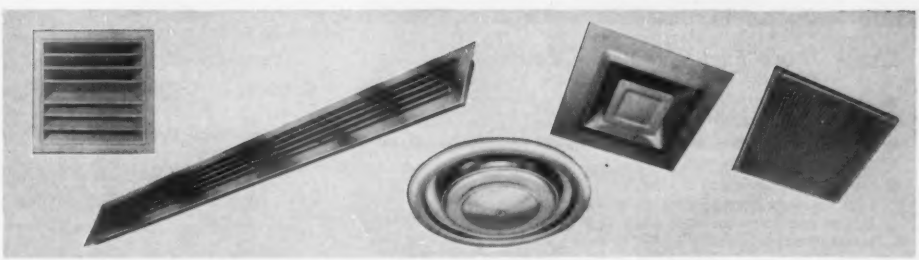


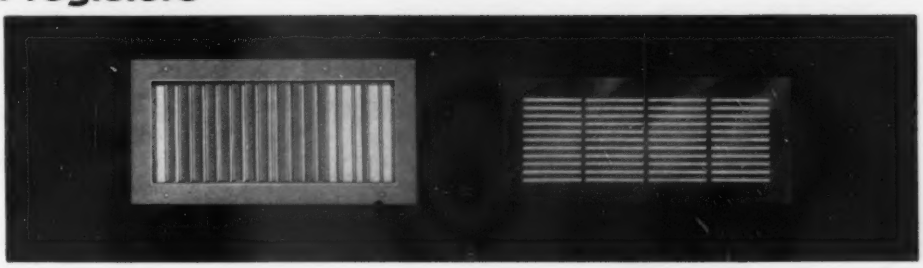
air diffusers

Shown are representative models in the complete Kno-Draft air diffuser line . . . adjustable and fixed pattern. Smart, simple styling that blends perfectly, unobtrusively with any interior, most recent additions are the KSS multi-pattern diffuser, extreme left, and the KO perforated diffuser, extreme right. Bulletins K-20A, K-27A.



grilles and registers

The extensive Kno-Draft line of grilles and registers offers a wide variety of face designs and rectangular configurations. Units that permit two-directional air flow, positive air volume control, other desirable features are available. Bulletin K-40.



CONNOR

DANBURY • CONNECTICUT

CONNOR kno·draft AIR DIFFUSERS

Check These Exclusive TORK Features:

- Should power fail precision spring mechanism takes over instantly . . . keeps on time for 20 hours!
- When power resumes electrically wound spring rewinds 10 times faster than used.
- Up to 12 operations a day with 2 hour minimum settings. Dial revolves once a week permitting longer or shorter periods of operation for each individual day, as well as skipping selected days.
- Choice of easy-to-set tab-type tripper dial . . . OR conventional ON-OFF dial!
- Available with Single Pole Single Throw, Double Pole Single Throw, Single Pole Double Throw, and Double Pole Double Throw switching.
- Highest capacity of any 7-Day Time Switch . . . up to 55 Amperes per pole.
- Compact, rugged design . . . same size as 24 hour models!
- Available without case, with bracket . . . or with Flush Enclosure, for panel mounting!

Here is the safest, most dependable Time Switch made . . . designed to meet the highest quality standards of Consulting Engineers and Architects. Insures comfort — no danger of Time Switch failing to operate when needed due to power failure. Economical too! No need for service screws to reset Time Switch after power failure.

Complete TORK catalog yours for the asking

TORK TIME CONTROLS, INC.
MOUNT VERNON, NEW YORK

In Canada: DOMINION ELECTRIC MANUFACTURING CO., LTD., TORONTO
Most Complete Line of Time Switches for Heating, Ventilating, Air Conditioning, Refrigeration, Water Softening, Sewage Disposal, Pumping, and General Electrical Applications.

law could expect a most unfriendly reception in Kansas, for example, and we doubt that any national organization could have much influence."

Van Doren reports that the relationship between Consulting Engineers Council and the NSPE functional section is a matter of concern to both groups. "Hueston Smith, president of CEC, and I have discussed the present unfortunate situation wherein the two organizations appear to be competitive. The main problem seems to concern whether or not business and professional matters can or should be separated. A meeting of officers representing the two groups for the purpose of finding all areas of agreement might be very productive. Extensive arguments about points of known differences could accomplish little. We all abhor duplication of effort and expense, and must find an acceptable solution to this situation.

"I have been greatly impressed by the abilities, energy, and dedication of purpose shown by representatives of CEC, including Hueston Smith, Hugh Duffill, Clifford Evanson, and Charles Pate.

"In the area of cooperation, I think the coordinating committee formed last year by CEC, the NSPE functional section, the American Institute of Consulting Engineers, the American Society of Civil Engineers, and the Engineering Division of the American Road Builders' Association has real possibilities. Its main purpose is to study and prepare information on the problem of relations of engineers in private practice with government. The organizations are well represented by capable engineers with a great deal of experience, and the group is small enough to permit accomplishment of considerable work. At least it should cut down on duplication of effort, and the left hand will know what the right hand is doing."

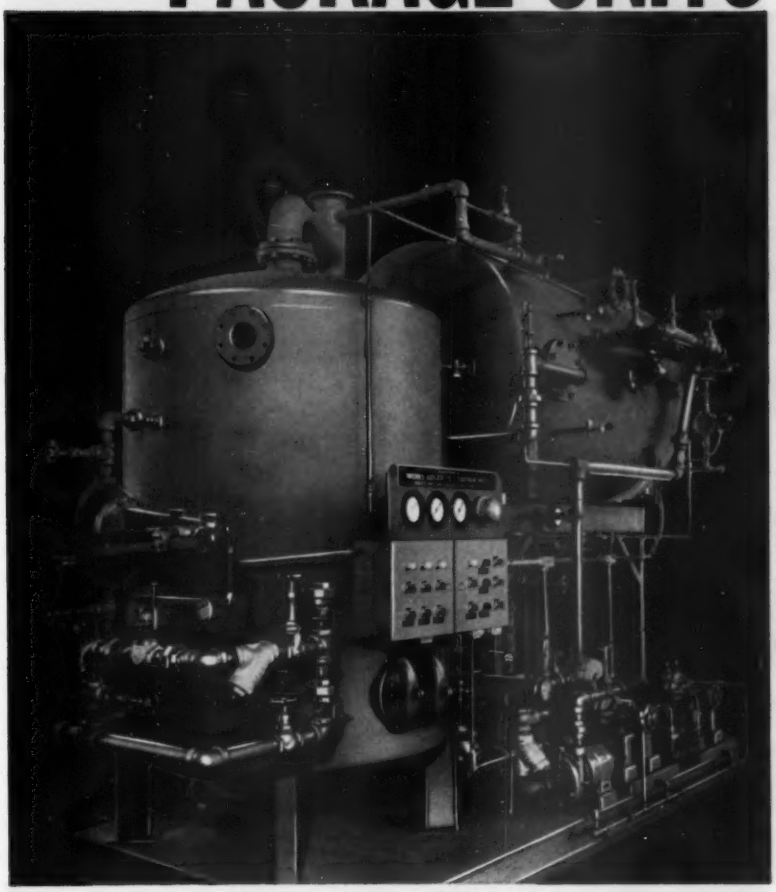
Professional Background

Van Doren has been as much of an individualist in his business as in his professional life. He first went into business for himself at the age of 16. While in high school, he had worked for a housing contractor and gained some proficiency in carpentry. He noted that his home town of Hays, Kansas, had no furniture repair and upholstery shop, so he opened one. Upon entering college a year later he reluctantly abandoned that venture, but his successor still is going strong.

The partnership of Servis and Van Doren was formed in 1945 in Hays. Five years later, the firm was moved to Topeka, and Stuart G. Hazard joined the organization as a partner in 1953. Servis now has retired, but remains an associate, acting in an advisory capacity. Servis, Van Doren & Hazard, engineer-architects, does airfields, streets and highways, bridges, buildings and special structural works, housing, water supply, flood control, drainage, and sanitation. They offer architecture; and structural, mechanical,

WICKES *standard*

BOILER AUXILIARY PACKAGE UNITS



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Wickes Boiler Co. now offers a packaged system of various compact combinations of DEAERATING FEED WATER HEATERS, BOILER FEED PUMPS, CONDENSATE SURGE TANKS and BLOW-OFF TANKS. Standard units available for steam plants of 10,000 to 100,000 lbs. of steam per hour capacity and steam pressure to 300 PSIG. Information on special units of higher capacities and pressures upon request. Each unit is shop-assembled on a structural steel base, completely piped and wired and equipped with all necessary controls and an instrument panel.

173

Write today for Bulletin 59-1, which gives detailed engineering information on all three models of Wickes Boiler Auxiliary Package Units.

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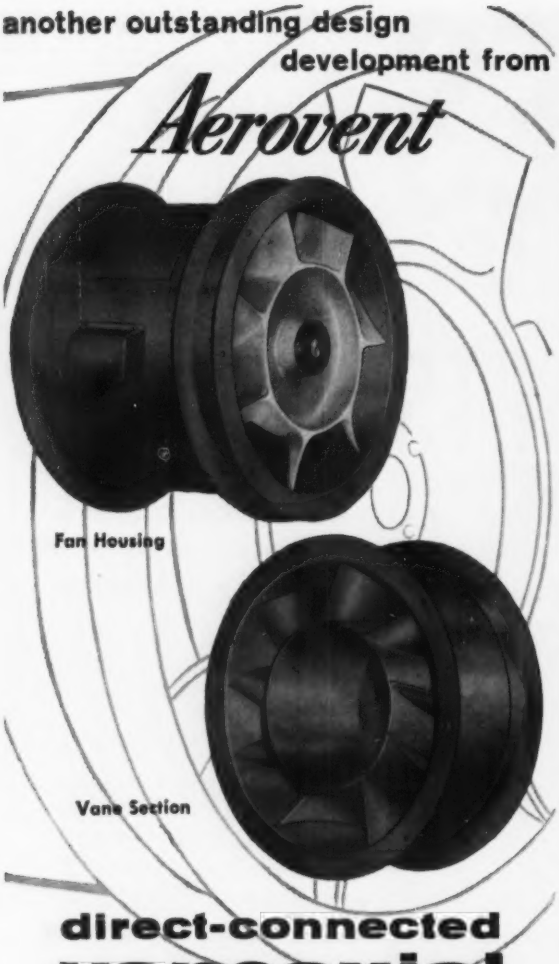
another outstanding design development from

Aerovent



direct-connected
vaneaxial
fans

with removable vane sections

Engineered for high-pressure, high-velocity air distribution systems, these units feature a unique removable vane section which simplifies installation and permits easy access for routine cleaning and maintenance.

Available in 30 models in sizes 18" to 48" for capacities from 3230 to 67,300 cfm with special design features for all application requirements.

Write for Bulletin 475

Air deliveries of all Aerovent equipment are tested and rated in accordance with established and accepted codes and each unit is guaranteed by the manufacturer to deliver its rated performance.

CERTIFIED PERFORMANCE

Aerovent Aerovent
FAN COMPANY, INC.
ASH AND BACON STREETS PIQUA, OHIO

and electrical engineering; as well as surveying and photogrammetry.

Since moving to Topeka, the firm's staff has grown from 20 to approximately 100 persons, with about 50 percent licensed engineers and architects.

Expansion Problems

"We began to learn, with some dismay, that our margin of profit was decreasing rapidly as the organization grew. After much study and soul searching, we became convinced that total overhead costs tended to quadruple as we doubled man-hours of direct effort on the work. This was the result of a natural and apparently logical desire to pyramid layers of authority and responsibility. Some of our best design engineers became too far removed from direct design work, and duplication of effort increased.

"Our particular solution has been to reduce layers of authority by selecting 17 key employees as staff associates who act as supervisors as well as designers. The associates receive guaranteed percentages of the firm's profits in addition to their salaries. Both salaries and profit sharing vary with our evaluation of the different individuals. Staff associates may act as project engineers, section chiefs, or both — or they may work with other associates, depending upon the current work load in various specialty areas.

"This cannot be illustrated very well by the usual organization chart so popular with some organizations, but we have found advantages. Associates do not request unnecessary help or attempt to hoard engineers and subprofessionals in their group in anticipation of future work. The supervisors now take initiative to shift assignments of personnel quickly to fit work loads, and have more than a casual interest in the efficiency of other supervisors. As individual projects near completion, the tendency to stretch the work has disappeared. We encourage every employee to attempt to become expert on a specialty of his choosing and insist that slack time be spent in study. No man is out of work unless he can prove that he knows all there is to know about everything. We do not mind paying a man for broadening his professional education on our time — but we take a very dim view of bull sessions."

The firm has vending machines for coffee, cold drinks (soft), candy, and cigarettes, with the profits going into an employee fund. There are no regular coffee breaks. "We have no objections to people drinking coffee as often as they may desire, but regular coffee breaks wreck efficiency."

The Topeka firm handles design on a construction volume ranging from $20 to $40 million a year. Fees vary considerably, particularly on military work, depending on complexity of work and scope of services. "We depend very little on published fee schedules. We determine our fees from estimates of cost, based on

Chosen to protect your children

. . . a prime essential to all business construction

Chances are great that you pass a Gamewell fire alarm box on your way to work, because a vast majority of all municipal fire alarm systems are Gamewell systems!

For over 100 years Gamewell fire alarm boxes have stood as silent sentinels in thousands of communities. The lives and the property these systems have saved are testimony of their unerring reliability. Similar Gamewell interior fire alarm systems, with the same high standards and offering the same reliability, can be planned as part of complete plant and institutional fire protection. Safety is everybody's business . . . *our* profession.

Send for your Gamewell Flexalarm catalog with typical fire alarm installations, see how you can plan maximum protection at minimum cost. Write THE GAMEWELL COMPANY, 1352 Chestnut Street, Newton Upper Falls 64, Massachusetts. A Subsidiary of E. W. Bliss Company.

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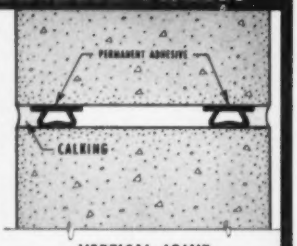
FIRST... WHEN SECONDS COUNT

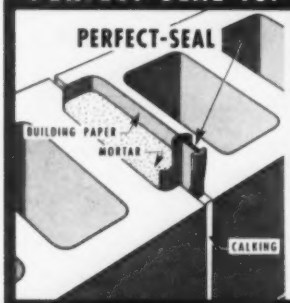
RUBBER or VINYL
SEALS and GASKETS
for PRECAST CONCRETE PANELS

Williams Panel Seals (Pats. Pend.) were developed especially for use in vertical and horizontal joints of precast concrete wall panels . . . they are extrusions of expanded, closed-cell Neoprene Rubber. This closed-cell material, and the hollow-core design, provide the properties which assure a positive pressure-contact seal in panel joints under all conditions—each type of seal readily compensates for variations in joint width, irregular joint surfaces and erection adjustments.



VERTICAL JOINT
6" Precast Concrete Panel

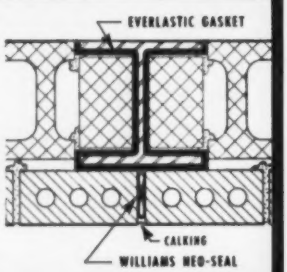
PERFECT-SEAL for CONTROL JOINTS



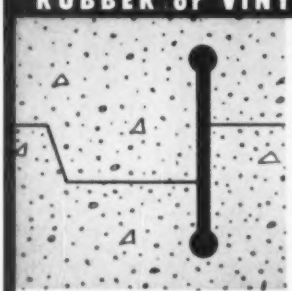
Williams "Perfect-Seal" (Pat. Pend.) is a specially designed seal for use in Mortar-Keyed Control Joints . . . it provides continuous four-point pressure-contact sealing which keeps moisture out of joints and prevents air passage. The T-Section is a high-grade rubber compound; the cross-sealing member at the base of the "T" is a strip of readily compressible, non-absorbent, expanded closed-cell Neoprene Rubber—it provides an effective pressure-contact seal directly behind the calking.

EVERLASTIC MASONRY GASKETS

Everlastic Masonry Gaskets are a readily compressible, nonabsorbent Elastomer which is impervious to water and inert to heat, cold and acids. In masonry joints, they permit linear expansion, and seal the joints against moisture penetration which causes frost damage. Everlastic Gaskets should be used between sill and coping stones, stone or prefab metal wall panels, and to isolate and cushion all steel or concrete columns to permit normal movement without damage to masonry walls.



RUBBER or VINYL WATERSTOPS



Williams Waterstops are made from Natural Rubber Stock and designed for maximum effectiveness in any type of cast-in-place construction joint. They will bend around corners, and will not crack or tear from shear action. Tensile Test: 3990 lbs., Elongation Test: 650%. Available in rolls up to 80 feet in length. Molded union and junction fittings available. Williams Waterstops can be furnished in Vinyl or Neoprene for industrial uses where resistance to oil or other injurious wastes is desirable.

See Sweet's Files, or Write for Information.

WILLIAMS
EQUIPMENT and SUPPLY CO.
486 W. Eight Mile Rd., Hazel Park, Michigan

past experience, then allow a reasonable profit. You could easily go broke following fee schedules blindly — and in certain instances, the schedules can be unfair to clients. A firm which furnishes completely adequate professional services cannot exist on substandard fees."

Van Doren is sold on the idea of combining engineering and architecture in a single firm. "The idea of dealing with only one firm appeals to many clients. We eventually may need to expand professional services to include more adequate management for the client if we are to offer something more attractive than the package deal."

Personal Background

Van Doren was born on the family homestead in Graham County, Kansas. Although there were no engineers in the family, he cannot remember even considering any other profession. While attending Fort Hays State College and Kansas State University, Van Doren worked at a variety of jobs, including carpentry, blacksmithing, heavy equipment operation, and as an instructor in drafting, wood turning, and sheet metal work.

His first engineering job was on the original soil conservation program. He worked as a surveyor-draftsman for the Department of Interior in Wisconsin for a year; was project engineer for the Soil Conservation Service in Minnesota for three years; and area engineer at Faribault, Minnesota, for three years. In 1941 he became field engineer for the Portland Cement Association at Minneapolis, Minnesota, and then joined the Civil Engineering Corps of the U. S. Navy in 1942.

Van Doren served as Operations Officer for the Seabee Training Center at Norfolk and Williamsburg, Virginia, for one year, and as Executive Officer for the 122nd C. B. on New Guinea and in the Philippines for two years.

"A most interesting project in the service was the building of a 200-bed hospital in New Guinea. We were given one month in which to complete the hospital. Needless to say, it was a 24-hour a day operation. The biggest problem was getting supplies. The proper material was around, but it was a question of locating it and then cutting red tape. Fortunately, we had a genius in charge of construction and an artist in procurement, who never was asked embarrassing questions. The hospital was completed on time, and the day we finished they started bringing in the wounded."

Van Doren, who is married to his high school sweetheart from Hays, has two sons. The older, who served on nuclear submarine "Skate," now is taking mechanical engineering at Kansas State University and wants to specialize in nuclear engineering. The younger wants to be the first man on the moon. ▲▲

AUDIO NEWS
for consulting engineers

CONVENTION COVERAGE IN HIGH FIDELITY SOUND

Cobo Hall's RCA Sound System Provides Superior Listening, Flexible Programming

All too frequently, convention halls are afflicted with massively ringing echoes, large areas of total inaudibility, or a combination of equally serious acoustical problems. A notable exception is Detroit's new Cobo Hall which is served by a comprehensive network of high fidelity sound systems.

This carefully integrated RCA sound installation was designed by Giffels and Rossetti, and the Industrial Communication Co., Inc., RCA Sound Distributor in the Detroit area. It consists of a central sound system and seventeen individually controlled satellite systems, a combination which not only provides quality sound throughout the vast reaches of Cobo Hall, but also affords the flexibility necessary to meet the requirements of highly varied convention programs.

Chief component of this network of sound is the central sound system which provides general public address coverage to all areas of the building. Controlled by a pair of specially designed master panels, this system is capable of transmitting seven programs simultaneously, and of paging selectively in each of the 36 sound zones. A

unique feature of the paging system is the linking of all major maintenance areas into one sound zone so that maintenance personnel can be paged throughout the building without breaking into the rest of the sound system. Another important feature of the central sound system is the handling of emergency announcements. Such announcements originating from the central point can override any of the satellite systems in use.

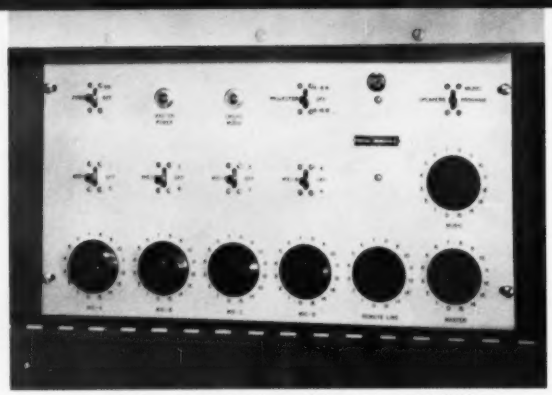
The satellite systems were designed for on-the-spot control of special programs originating from the convention, display and banquet areas. The largest of these systems serve the main exhibit areas, Halls A,

AUDIO NEWS for consulting engineers

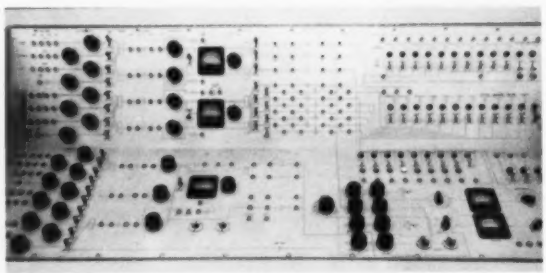
B, and C, each of which is 100,000 square feet in area. Through removal of partitions, these halls can be converted into one grand hall; similarly the three sound systems which serve them can be patched into one system that can provide sound for the entire area. Other satellite control areas include the banquet rooms, promenade, coffee shop, parking areas and garage. Each of these systems operate independently and each is linked to the central system through the master control panels. Together, the central system and the satellites are capable of transmitting twenty-seven programs simultaneously.

As might be expected the number of components which make up these systems is quite large. There are six hundred 8-inch speakers located throughout the building; in all a total of 700 speakers and horns are used. There are 1300 patch jacks and 260 microphone outlets. Over 160 amplifiers, capable of providing 2,220 watts of power, are housed in twenty-one racks at the various control areas. Most noteworthy is the fact that all of this equipment is of broadcast quality, enabling Cobo Hall to achieve high fidelity sound in all areas.

The Cobo Hall story is a tribute to the engineers and technicians who designed and installed it and still another proof of RCA superiority in sound. This superiority has been demonstrated again and again in sound installations of every size and type. Technical data on any of RCA's more than 500 Audio Products may be obtained from Authorized RCA Sound Distributors or by writing Radio Corporation of America, Bldg. 15-1, Camden 2, N. J.



Wall Mounted Control Panel for Banquet Hall West



Front Panel of Master Control Console

Control Center for Main Banquet Hall Sound System

Amplifier Racks for Third Floor Meeting Rooms

THE MOST TRUSTED NAME IN ELECTRONICS

RADIO CORPORATION of AMERICA

RCA

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unbiased recommendations for any heavy lifting job because...

AMERICAN 150-ton intake gantry crane on the Rocky Reach Dam, specified by Stone & Webster Co., Boston, consulting engineers on the project.

at American Hoist & Derrick Company we produce *all* basic types of cranes and special materials-handling equipment: bulk unloaders, gantry cranes, revolver cranes, locomotive cranes, crawler and rubber-tired cranes, and a wide variety of specially-engineered products. This important fact enables us to be completely flexible in our thinking... and in our recommendations.

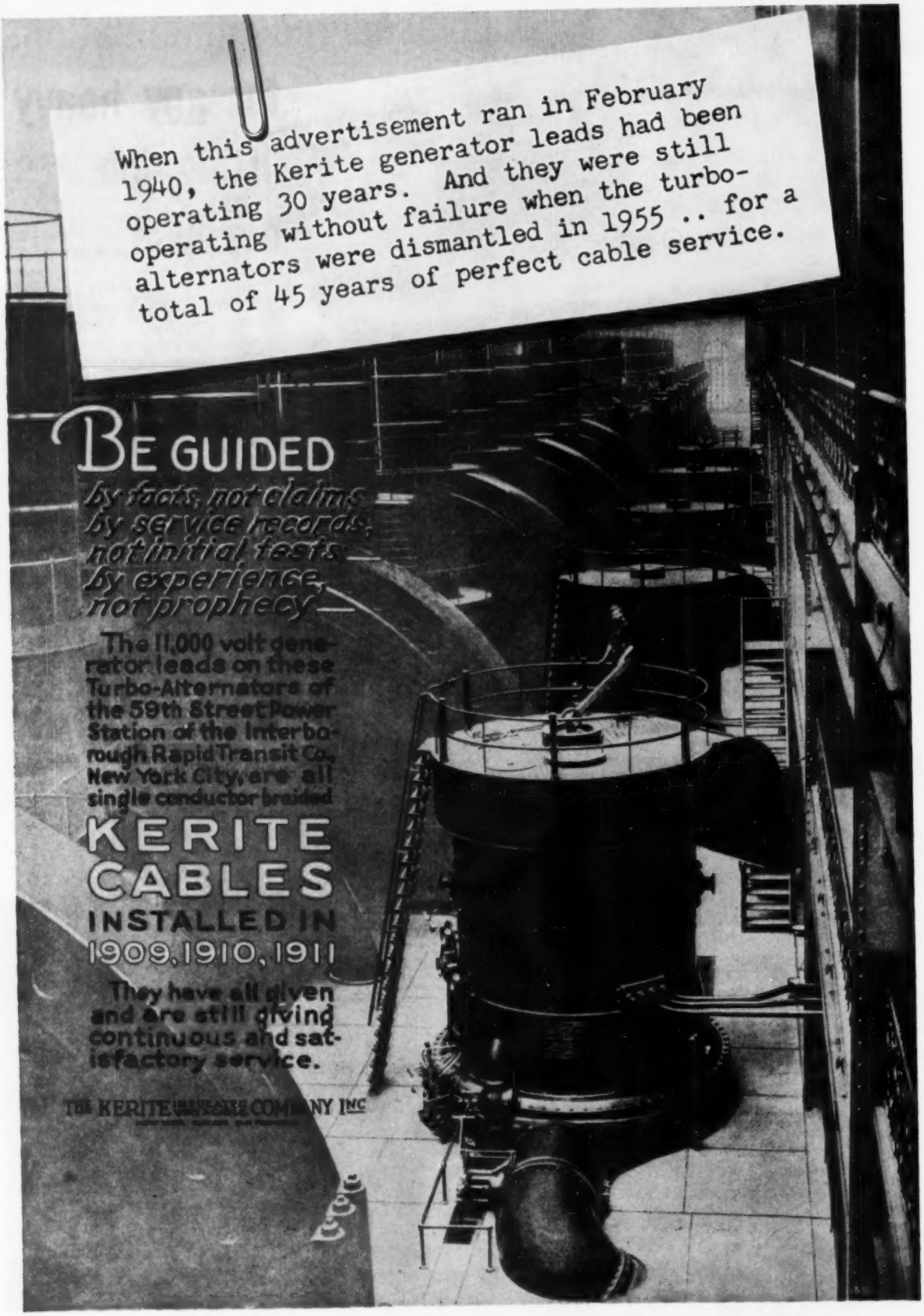
Over the years, we have cooperated with consulting engineers on *hundreds* of specialized materials-handling installations... of all types, sizes, and capacities. Don't you agree that this experience — and freedom to make unbiased recommendations — can be of value to you and your clients?

EP-1001

AMERICAN

AMERICAN HOIST
and DERRICK COMPANY
ST. PAUL 7, MINNESOTA

When this advertisement ran in February 1940, the Kerite generator leads had been operating 30 years. And they were still operating without failure when the turbo-alternators were dismantled in 1955 .. for a total of 45 years of perfect cable service.


BE GUIDED
by facts, not claims
by service records, not initial tests
by experience, not prophecy
The 11,000 volt generator leads on these Turbo-Alternators of the 59th Street Power Station of the Interborough Rapid Transit Co., New York City, are all single conductor braided
KERITE CABLES
INSTALLED IN 1909, 1910, 1911
They have all given and are still giving continuous and satisfactory service.
THE KERITE COMPANY INC

These KERITE cables

. . . were designed without any of the accurate methods now used to determine conductor size. They were overloaded throughout their lives, and although they were installed in brass pipes and operated at 11,000 volts, they were protected only with a non-conducting cotton braid.

1909

In 1946, one lead was removed, reeled, and shipped to the Kerite factory for investigation.

In spite of 36 years of thermal abuse, almost constant electrical discharge at its surface, and the physical handling involved in its removal and shipment, the minimum 60-cycle A.C. breakdown was above 90 KV with the average 10 KV higher.

Kerite engineers have pioneered improvements in almost every element of generator cable . . . *but the consistently high qualities and long life of the Kerite insulation remain the same.*

1960

THE KERITE CO.
30 Church St.
New York 7, N. Y.
Sales offices in principal cities.

Mrs. Genevieve Barbour and Frank Brown, of Producers' Council, flank CEC judges Leroy Nettnin, Hueston Smith, Earl Krueger, Don Kroeker, and Wm. Campbell.

CEC-PC Literature Competition

THE Consulting Engineers' Council-Producers' Council, Inc. First Annual Engineers' Technical and Product Literature Competition drew over 250 entries from 115 manufacturers — in spite of a deadline for entries that followed close on the heels of the announcement of the competition. Frank Brown and Mrs. Genevieve Barbour of PC, who made arrangements for the judging on March 31 at Chicago Midway House, commented that the enthusiastic response to this first competition already has given it a status comparable to the long-established competition, sponsored by the AIA.

Judges from the Consulting Engineers' Council included Leroy H. Nettnin, co-chairman of the CEC-PC Joint Committee; Hueston Smith, retiring president of CEC; Earl Krueger, president of the Consulting Engineers Institute of Wisconsin; J. Donald Kroeker, chairman of the CEC Public Relations Committee; and William J. Campbell, president of the Illinois Association of Consulting Engineers.

Awards of exceptional merit were given to the Wire Reinforcement Institute, Ramset Fastening System, Dow Chemical Company, and Inland Steel Products Company. Certificates of merit to the American Iron & Steel Institute, Lennox Industries, Inc., Crouse-Hinds Company, and Smith & Loveless. Honorable mention to the National Concrete Masonry Association, General Electric Company, Ranney Method Water Supplies, Inc., and Granco Steel Products Company.

Award winners will be honored at a special luncheon to be held on May 4 in Chicago, in conjunction with the CEC Annual Board Meeting. The judges, who were forced to abandon the traditional 8-hour day when they selected the winners, also are deserving of a share of the luncheon honors. Selecting the winners proved a particularly difficult task, and several letters of commendation are being sent to entrants who failed, by a narrow margin, to earn specific awards. While some of the entries indicated indifference to or ignorance of the difference between consulting engineers and architects, it is significant that the Inland Steel award of exceptional merit was earned by an advertising campaign specifically directed to consulting engineers and run in CONSULTING ENGINEER. ▲▲

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Assured Reliability due to:

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Panalarm maintains a large staff of annunciator engineering specialists to assist with special annunciator design and application problems. Sales and engineering offices are in all principal cities.
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Annunciators • Control Panels • Data Systems

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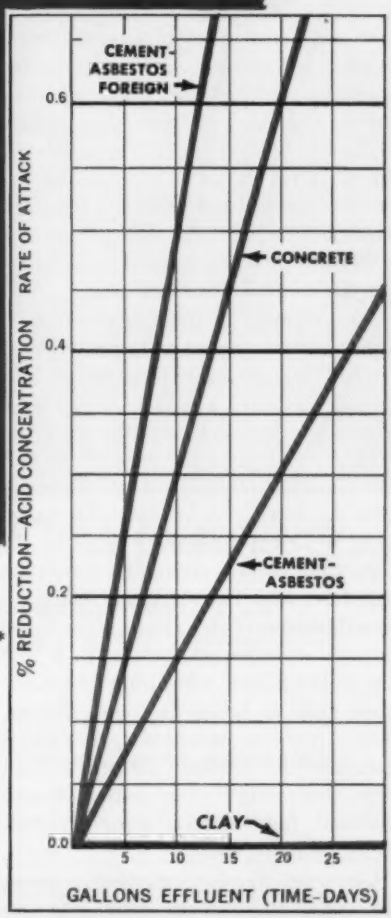
NEW CLAY PIPE

An 8.6%* Sulphuric Acid solution was recirculated through four standard pipe materials in this Laboratory Test. The graph tells the tale. Substitute pipe materials began to erode immediately, but Vitrified Clay Pipe was completely unaffected. Hydrogen Sulfide is present in all Sanitary Sewers ($H_2S + H_2O = H_2SO_4 + H_2O$) . . . additional proof that *only* Clay Pipe handles the expected contents of a sewer. Test information furnished upon request.



New Greater Strength
New Wedge-Lock Joints**
New Longer Lengths
New 100-Year Written Guarantee

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CS-361-50

CLAY SEWER PIPE ASSOCIATION, INC.
311 High-Long Building • 5 E. Long St. • Columbus 15, Ohio

From the Editor's

Tranquil Tower

New Trend for the Turnkey?

NOT TOO LONG AGO the electric power industry was startled by the award of turnkey contracts to two apparatus manufacturers, one by the Texas Electric Service Company and the other by the Oklahoma Gas & Electric Company. This is more or less old stuff in the chemical industry, and also on overseas projects, but the practice has been less than satisfactory to the manufacturer who did not get the contract, and the reaction of manufacturers of auxiliary equipment has ranged from lukewarm to cold.

For example, in the design of coal burning steam stations, the conveyor industry has been working with consulting engineering firms and utility company engineering staffs for a long time. They understand each other's problems, and, with few exceptions, have been able to work well together. Their relationship with the manufacturer-engineer-contractor, not familiar with the intricacies of materials handling, has often been less than cordial.

Package plants, such as the small sewage treatment unit, have long been with us. While it is true that the manufacturers of these units often have acted as manufacturer-engineer-contractors, it is equally true that the independent consulting engineer has specified these units as being the best solution to his specific client's problem. It would appear that the power producers are now looking for similar standardization for large generating station units. It may be possible and practical, but we have some reservations about the approach being used.

Certainly, the decision of two power producers in the utility industry to enter into turnkey contracts with apparatus manufacturers is going to have a great impact on many segments of our economy, but our greatest concern is for its impact on the consulting engineering profession. It is a fact that the consulting engineer has not been entirely left out of the turnkey contract picture. For example, Texas Electric Service Company retained a consulting firm to work with its own engineering staff to develop a set of general specifications. On the other side of the street, the apparatus manufacturer retained a consulting engineer for detail design. The same approach has been used on many overseas turnkey projects handled by manufacturer-engineer-contractors.

The retention of consulting engineers on these projects might, at first glance, make everything appear to be rosy. However, we wonder just how the consulting engineer operates under this kind of an arrangement. Does he retain his right to specify the best piece of equipment, regardless of who makes it? Does he develop a design that favors his client (the apparatus manufacturer-engineer-contractor), or does he design with the best interest of his client's client in mind? Is he retained as a professional and independent engineer, or is he hired as a part-time employee of the manufacturer-engineer-contractor?

These are some of the basic dilemmas which the consulting engineer faces when he gets himself involved in a manufacturer-engineer-contractor type of relationship. He is like the farmer caught astraddle a barbed wire fence. He cannot stay where he is, but he will get scratched no matter which way he jumps.

The engineer in private practice cannot survive on his engineering ability alone. Rather, he must depend on his engineering ability backed up by his freedom to make independent judgments of manufacturers' equipment. There are many extremely competent engineers in industry, but they have, to a greater or lesser degree, abdicated their right to independent judgment when their own employer's products are in question. Stated simply, they are hired – not retained.

Can the consulting engineer in private practice afford to be hired? ▲▲

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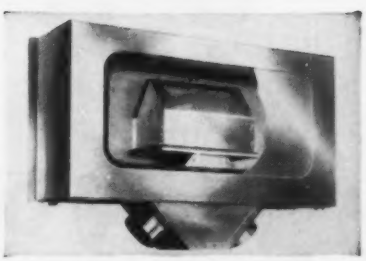

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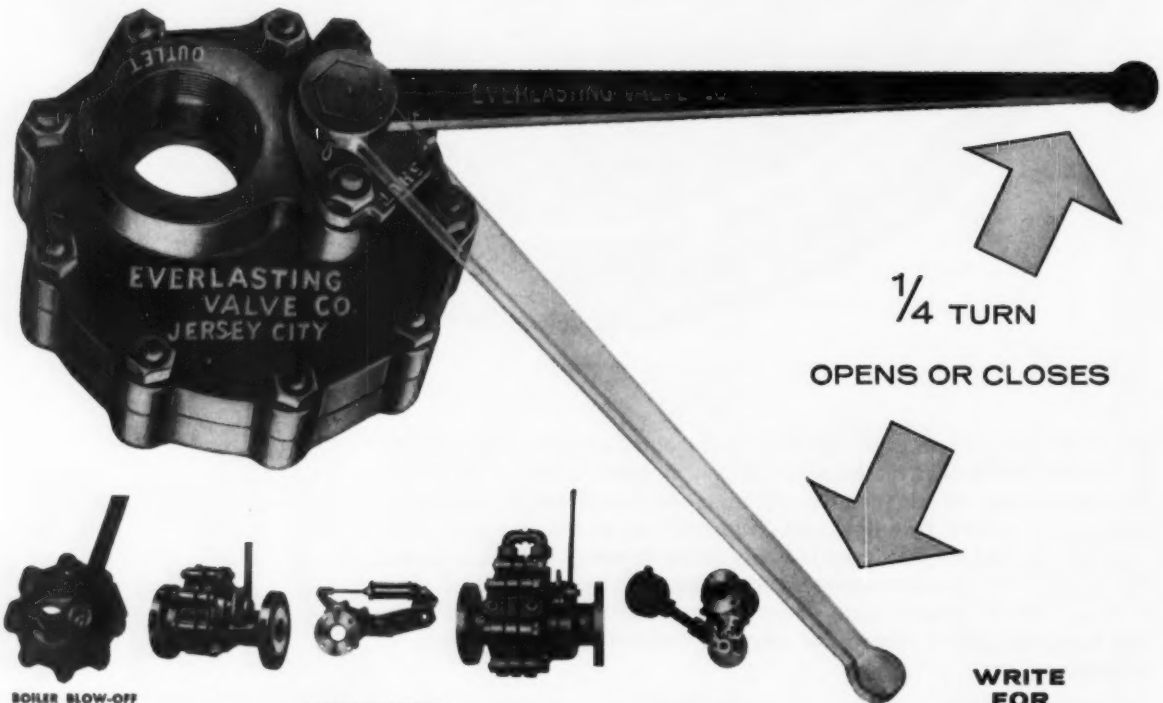

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Readers' Comment

Professional Registration

When I commenced the practice of professional engineering in St. Paul, Minnesota, the licensed professions and crafts were lawyers, doctors, plumbers, and electricians. Professional engineers were employed on the basis of their experience as well as formal education. Later, about 1923, New York State politicians passed out licenses on the basis of accomplishment questionnaires — New York State and others have been collecting registration fees from professional engineers ever since, on the theory that such registration protects the public. The only sure thing it does is to collect a tax or fee.

The working conditions of professional engineers parallel those of plumbers closer than they do those of doctors. In other words, most professional engineers, like plumbers, are employed by others. So laws that have protected the public for many years from unsafe plumbing systems can furnish the pattern for laws to protect the public from professional engineering failures.

A plumbing firm owner must be licensed as a master plumber on the basis of an appropriate examination. He employs licensed journeymen plumbers to install plumbing as well as other individuals qualified to carry out the necessary business functions. Similarly, the professional engineer in private practice employs licensed professional engineers and draftsmen, without, however, any license or registration qualifying him to conduct a private engineering practice. His only license has been given on the basis of an examination covering basic engineering subjects and some experience as an employee in theoretical charge of engineering projects.

What is required to protect the public . . . is public recognition of the duties of a practicing engineer as contrasted with those of a registered employee engineer. Such recognition would make the preparation of model laws — for the protection of the public and engineers alike — relatively simple.

Harry Terry
Consulting Engineer
Trenton, New Jersey

Direct Mail

Your article on what to do with the direct mail was most interesting. We, too, have the problem, and do not have full time secretarial help — we prefer it that way.

I admit I am compelled to throw away some mail that is unread, especially book publishers' announcements. This kicked backed recently when I found I had thrown out a letter from a large publisher telling me they were going to give me a contract to write an engineering book for them. If their local "trav-

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eler" hadn't contacted me to see why I didn't answer, I never would have gotten the contract.

By the way, your plastic magazine cover is good, but too tough. I suggest a thinner gage that can be ripped off easier.

George H. Amber
Detroit, Michigan

Labor Problems

The local Wage and Hour Division of U. S. Department of Labor is attempting to claim that Lester Engineering Company, an engiing firm in Jackson, Mississippi, is covered for wage and hour purposes because they have crews surveying purely local county roads. I have been unable to find any case law which would indicate that coverage applied to survey and engineering work on purely local county roads within each individual county. These roads are not interstate roads; however, it is true that they might in some cases connect with interstate roads, that is, they would in some cases lead into interstate roads and into state highways. This work is done for the local County Board of Supervisors, and all reports are made to them.

We asked the Regional Attorney in Birmingham for a ruling on this particular point and I enclose a copy of his ruling . . .

We would greatly appreciate any information or assistance which you might render to us in this matter. We feel that this is a possible "pilot" case and one which your profession should be highly interested in. We would, therefore appreciate any assistance which you might offer in this matter.

Wells, Thomas & Wells
Attorneys at Law
Jackson, Mississippi

The ruling by the Mississippi regional attorney was against the consulting engineer. As we are unable to cover specific legislation and rulings in each state, we would like to hear from readers who have had similar labor problems.

No Fee in Ohio

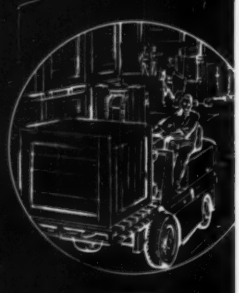
In the March issue under the column "Heard Around Headquarters" you state that, until this year, Maryland was the only state that did not have a yearly charge for registration. I wish to point out that Ohio charges $3.00 for renewal only in the years when the fund falls below a certain level. It has always been that way in Ohio and still is. The renewal charge for registration is necessary only about once in three years.

Elbert J. Leuty, P. E.
Marion, Ohio

Large Dams

I was much impressed with and interested in the article in the February issue of CONSULTING ENGINEER on "Large Dams" by G. S. Sarkaria. As a layman, I found it very illuminating. My work at

SHOULD YOU RECOMMEND EMERGENCY LIGHTING TO YOUR CLIENTS?



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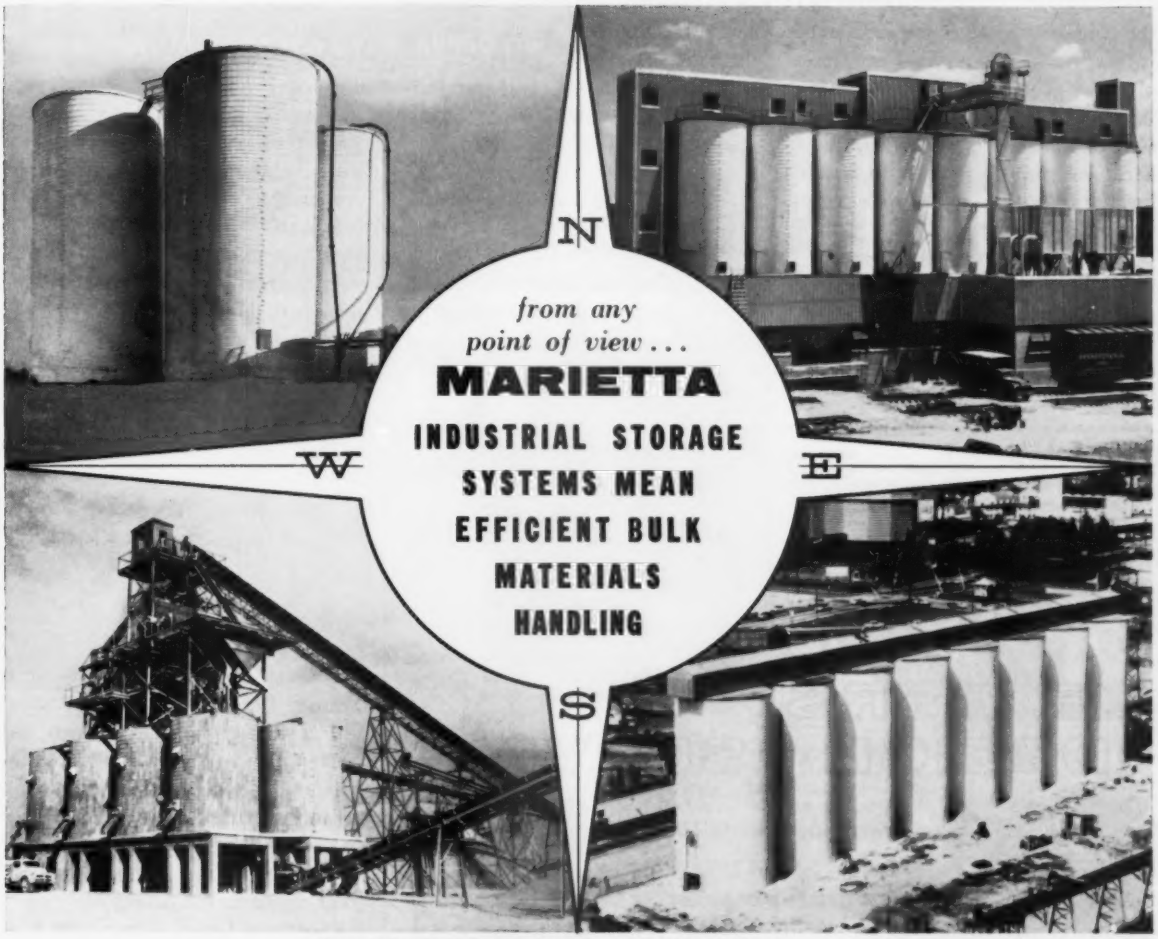

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Lower Left — Standard Industries, Tulsa, Oklahoma
Upper Right — American Radiator & Standard Sanitary Corp., Plainfield Plant, Wauregan, Connecticut
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the Embassy involves me frequently in discussions with – or more often explanations from – engineers about projected dams in Greece. The article by Mr. Sarkaria has supplied me with much background that will prove very helpful in the future.

If you have a reprint of the article, I would be grateful for a copy. If there are no reprints, may I suggest that it might be a profitable device for the circulation manager to have some made, sending them to persons like myself in American Embassies and our ICA missions in countries where dams are being built or contemplated.

Roger Dow
First Secretary of Embassy

Corporate Licensing

In analyzing corporate practice, it should be kept in mind that a corporation, which is composed of one or more persons acting as a single individual, is an artificial person with a perpetual franchise. Licensing a corporation (without any actual qualifications) to practice professional engineering – provided only that the person in responsible charge is licensed – is one small step from the corollary that any nonprofessional natural person with no engineering qualifications should also be licensed merely because he so requests – provided again that this person retains another person in responsible charge of engineering who is licensed. The latter proposition is actually more logical and better protects the public interest.

Leonard M. Todd
Consulting Engineer
New York, New York

Error Noted

We have noted under "The New Projects," in the March 1961 issue of CONSULTING ENGINEER, an article on page 158 entitled "Washington Tollway" which contains an erroneous statement pertaining to the consultant on this project.

The report was prepared by a joint venture, consisting of:

¶ Knoerle & Graef, Consulting Engineers, Chicago – highway engineering and financial feasibility.

¶ International Engineering Co., San Francisco – tunnel design.

¶ E. A. Barton & Associates, Cleveland – traffic and revenue.

¶ Bertram H. Lindman, Washington, D. C. – economic benefits to regions served.

Joseph K. Knoerle
Knoerle, Graef, Bender & Assoc.
Chicago, Illinois

International Thanks

I am very grateful to you for sending your very interesting monthly publication CONSULTING ENGINEER. It is a valuable documentation for us European engineers – it informs us about American progress in the technical and industrial fields.

G. Bory
Vice President of FIDIC
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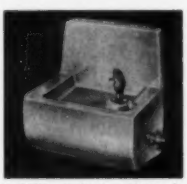

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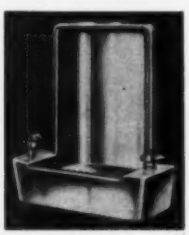

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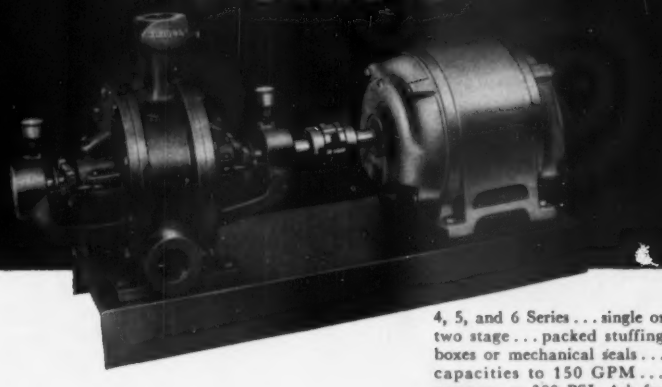

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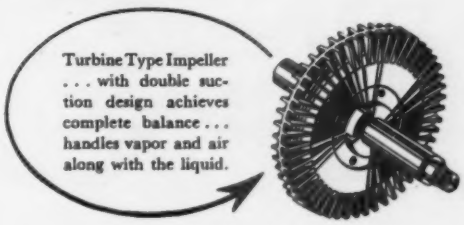

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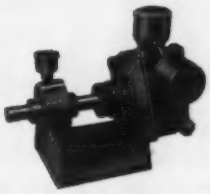

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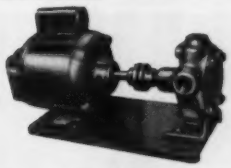

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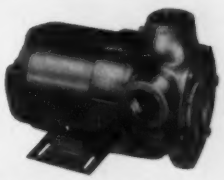
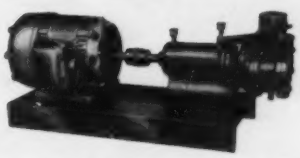


Type V4 . . . close coupled . . . single stage . . . mechanical seal . . . capacities to 30 GPM . . . heads to 350 feet. Ask for Bulletin V-111-B.



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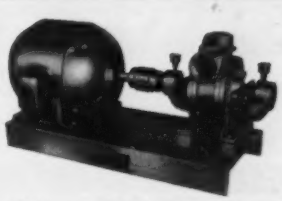

Type X40 . . . water jacketed packed stuffing boxes or mechagical seals . . . single or two stage . . . capacities to 60 GPM . . . heads to 350 feet. Ask for Bulletin 111XJ.

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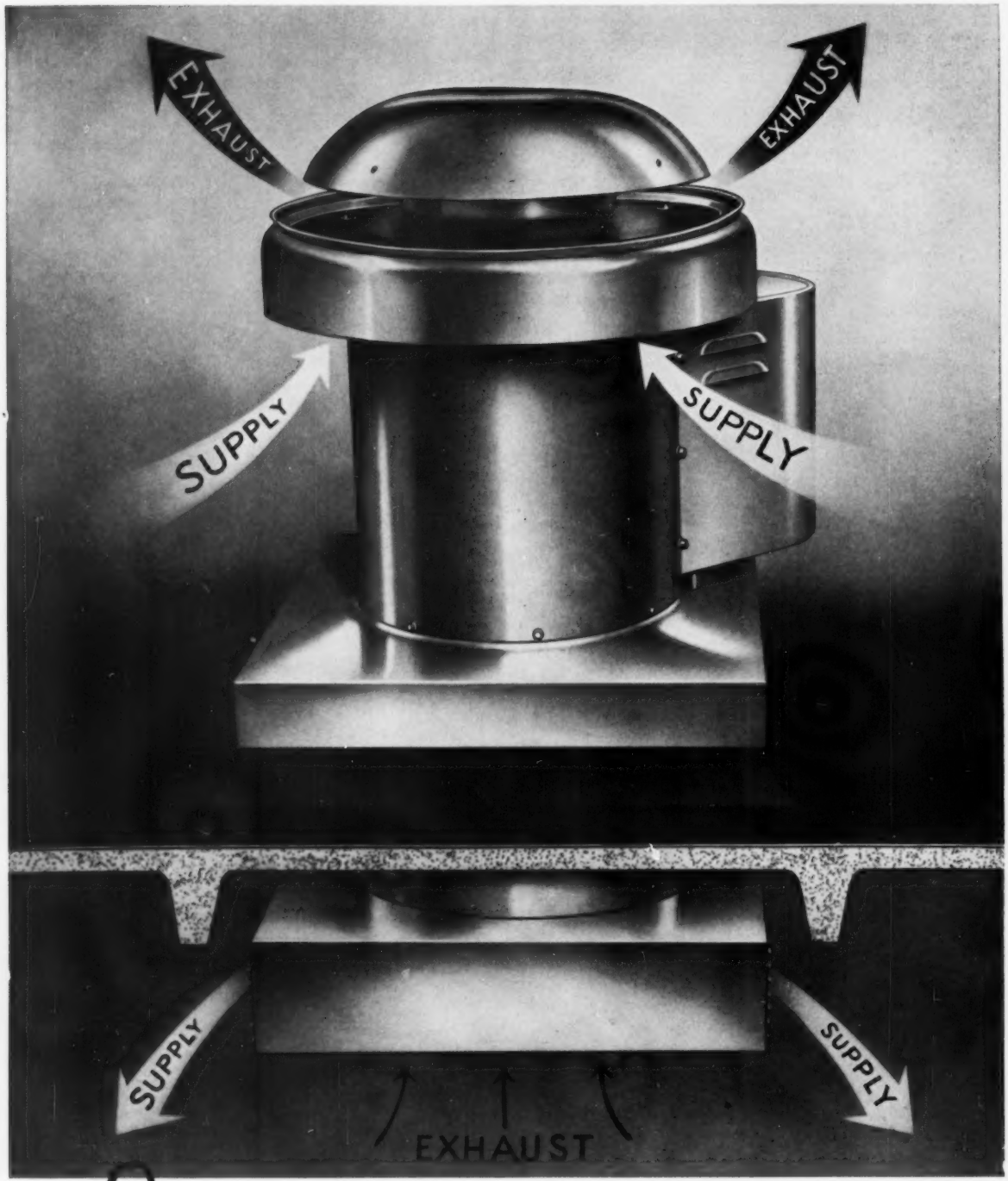

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Heard Around Headquarters

MARJORIE ODEN

Eastern Editor

Merger Complications

The proposed merger of Engineers Council for Professional Development and Engineers Joint Council regularly gets more complicated.

It was reported in CONSULTING ENGINEER that the deciding vote on the proposed merger was held by the National Council for State Boards of Engineering Examiners. This is incorrect. We had heard that the American Society for Engineering Education had voted in favor of the merger, but ASEE did not vote until April.

However, the picture is further complicated by the approval for ECPD membership of the Institute of Radio Engineers and the Institute of Aerospace Sciences (formerly the Institute of Aeronautical Sciences). Now the two new members, whose boards have yet to accept membership, also will have a vote. Since a two-thirds majority is needed for ECPD approval of the merger, at least seven of the present ten member groups must approve the proposal.

The current scorecard: the American Institute of Mining, Metallurgical, and Petroleum Engineers; the American Society of Civil Engineers; the Engineering Institute of Canada; and the American Institute of Chemical Engineers have approved the merger proposal. Opposed are the American Society of Mechanical Engineers and the American Institute of Electrical Engineers. Of the unknown votes (ASEE, NCSBEE, and the two new societies joining ECPD), three out of four must approve for the merger to go through.

At the AIA Convention

The American Institute of Architects (like so many engineering organizations) is having trouble matching its ambitions, its current programs, and its budget.

At this year's meeting of the AIA in Philadelphia, it was suggested that the organization charge "annual supplemental dues to all firms, partnerships, and corporations, some or all of whose owners, partners, or officers are corporate members of The American Institute of Architects. Such annual supplemental dues shall not exceed two percent (2%) of the total annual Federal Insurance Contribution Act Tax (FICA) each firm pays for the preceding year."

It was explained that this method of raising more money was chosen – instead of just raising all dues – because the AIA wanted to be sure dues would not become a hardship for beginning architects. The Board was expected to set the current limit at one percent of FICA taxes; even this would bring in an estimated $200,000.

Among the programs AIA plans to emphasize with the additional funds: broader field service, par-

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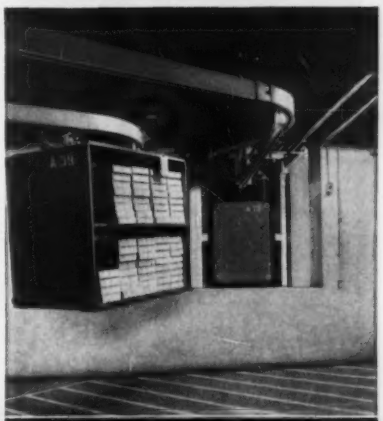

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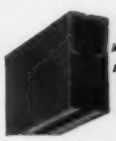

Employs exclusive unitized "over and under" power and free rail which permits simple switching to right or left as desired.

Power-Flex is designed for automated materials forwarding applications in industrial plants, distribution centers, service buildings and department stores. The most economical system available for loads up to 600 lbs. per carrier. Savings in actual installations range from 25% to 60%.
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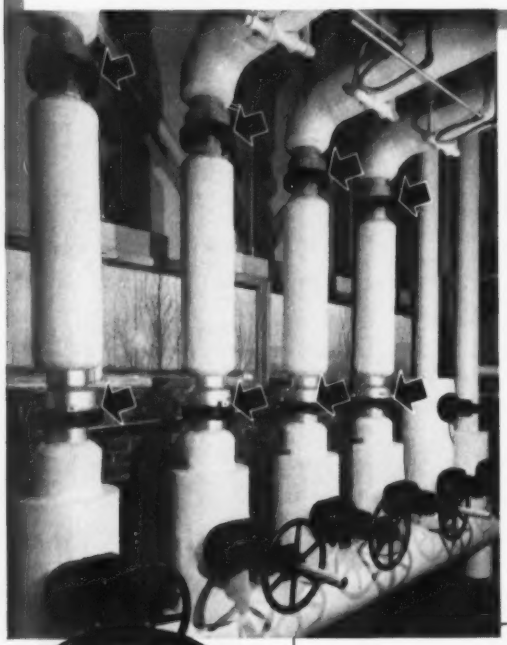
Barco Solves Valve Piping Expansion Problem



Relieves Strain on Valves

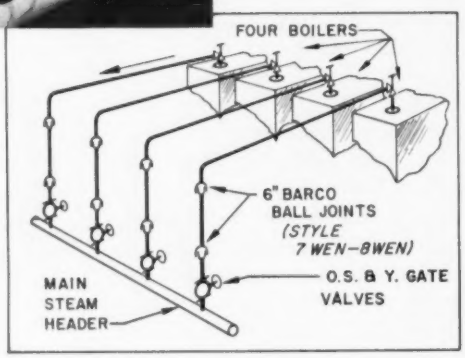
This photograph shows an interesting new installation of eight Barco Flexible Ball Joints (see arrows) on four 250 psi boiler steam lines in a West Coast industrial plant. The schematic diagram (below) shows the piping layout.

Due to the fact that operation of individual boilers is intermittent, complicated expansion, contraction, and torsional movements occur in the piping. All of these movements are easily accommodated with the aid of the Barco Joints, relieving reactive forces on the valves.

BARCO

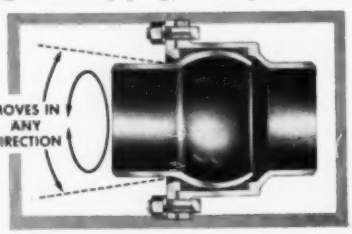
BALL JOINTS

1. Handle Expansion
2. Relieve Torsion
3. No "End Thrust"



PROBLEM—Originally, in the plant shown above, it was thought that the "spring" in the long runs of piping would take care of *thermal expansion* and *torsional stresses*. SUCH WAS NOT THE CASE. Serious trouble was encountered, tending to crack valve flanges and twisting so they would not seat tight.

ANSWER—Barco Ball Joints solved the problem, LOGICALLY, SIMPLY, ECONOMICALLY. These rugged all-steel joints have no thin wall sections, no critical points of fatigue, no rubber seals. They are practically indestructible. They provide points of flexibility in piping. Easy to engineer. They fit right in the piping; develop no "end thrust"; require no expensive anchoring. Sizes and styles to meet your requirements. *Send for catalog and information.*



BARCO MANUFACTURING CO.
572F Hough Street, Barrington, Illinois
In Canada: The Holden Co., Ltd., Montreal

ticularly in conducting public relations workshops on the regional level; a new post-graduate educational program; increased efforts to work with Federal agencies; expanded committees and additional regional sections; and closer liaison within the building industry.

Contract Forms

About 10 years ago, the American Institute of Architects, the American Society of Civil Engineers, and the National Society of Professional Engineers began discussing joint contract forms for architects and engineers. At their annual meeting this year, AIA approved three forms for use when the engineer is working for an architect. The forms have the engineer and architect on a basis similar to that of the architect and the client. The three forms cover percentage fees, cost plus fees, and fees based on a multiple of direct personnel expense.

During the years of discussion, ASCE withdrew from the negotiations. Then, at its winter meeting in 1959, NSPE agreed to publish the forms without AIA approval. The new AIA forms are reported to be quite similar to the contracts put out by NSPE previously.

Unions Still Trying

Although two of the three large unions with engineer membership have folded, the consulting engineer still faces the danger of having his staff organized. Unions that formerly belonged to the Engineers and Scientists of American have been sitting quietly, but the AFL-CIO is reported to have the organization of consulting staffs definitely on the docket.

However, in two recent cases the consulting engineer won. In Youngstown, Ohio, technical employees of Consulting Engineer Robert J. Schomer voted by 25 to 9 not to join the AFL-CIO. And in Fairbanks, Alaska, the firm of Gray, Rogers, Graham & Osborne, engineers, architects, and land surveyors, was found not guilty of unfair

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MONEY—

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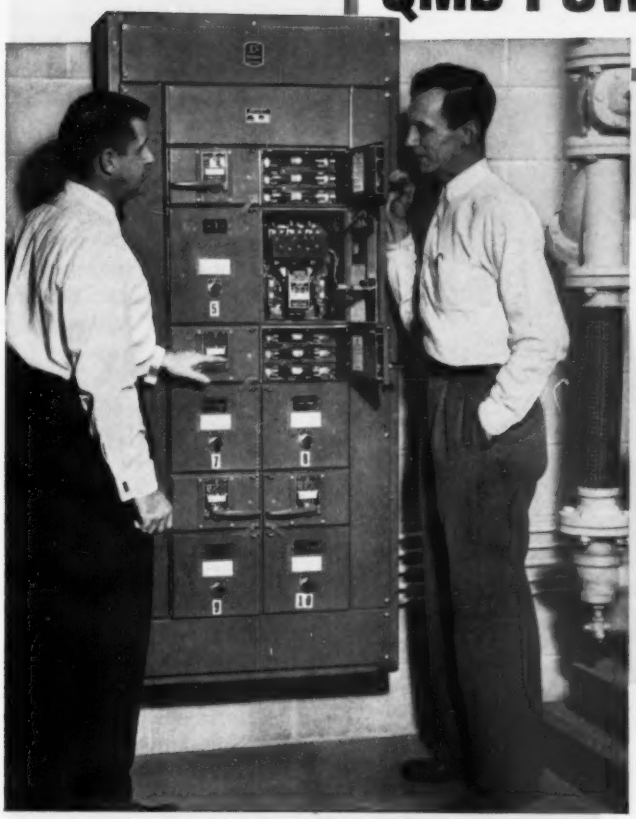

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If the above installation had been made the old way —with trough, and ganging separate switches and starters—it would have taken at least six feet of wall space instead of 30 inches, and four times the installation time.

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QMB panelboards accommodate reversing or non-reversing starters, sizes 0 through 4; plug-in circuit breakers through 225 amperes; plug-in switches through 200 amperes (bolted through 600 amperes).

Twin Unit (above) available 15-100 amperes
Single Unit available 125-225 amperes

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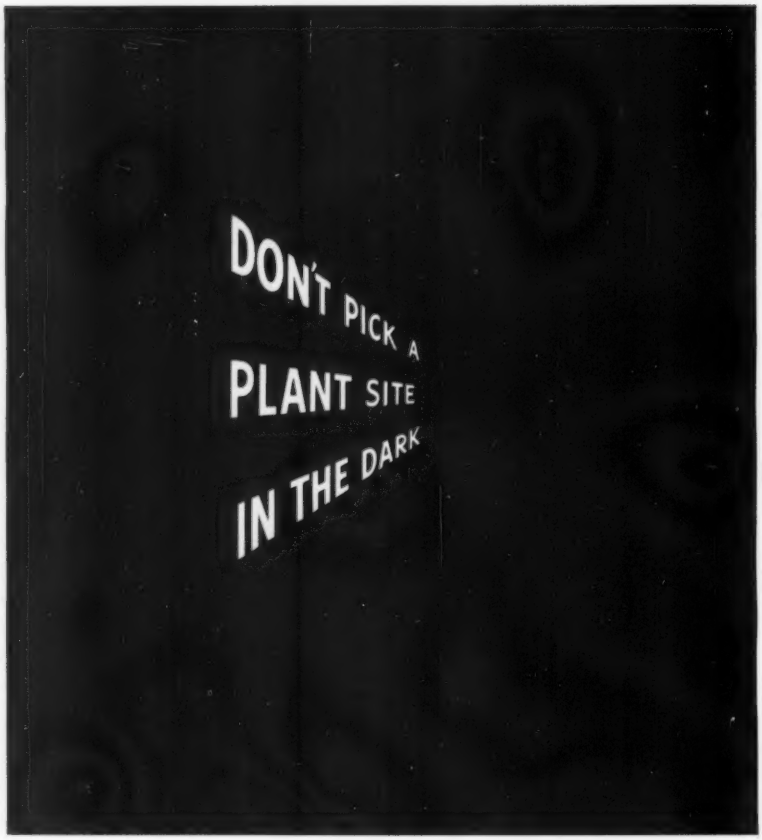

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WE COULD GO ON for hours about the profit potential UPSTATE. But why not tell us *your* problem so we can get down to specifics, such as which communities offer financial assistance and incentives for new industry. A phone call, wire, or letter will get the ball rolling. Contact Richard F. Torrey, Niagara Mohawk Power Corporation, Dept. CE, 300 Erie Blvd., West, Syracuse 2, N. Y. Telephone GRanite 4-1511.

NIAGARA MOHAWK

INVESTOR OWNED—TAXPAYING

labor practices, in refusing to bargain with a union representing less than a majority of their surveyors.

Anti-Consultant Bill

A College Facilities Act, designed to allow colleges to borrow Federal funds for building, would give the engineering and architectural design work on these college buildings to the Housing and Home Finance Administration.

A qualification tacked onto the bill objects to "elaborate or extravagant design," and specifies that all architectural and engineering services required in administration of the Act must be performed by the Housing and Home Finance Administration. The National Society of Professional Engineers has urged that the bill be amended.

The NSPE statement to the sponsor, Rep. Peter Frelinghuysen Jr., of new Jersey, points out that, "Private engineering design consultants, and architects as well, deplore any design or specifications which could result in an unnecessarily elaborate or extravagant project. To do otherwise would be contrary to recommended ethical practices and would constitute a disservice to the client, be it a Government agency or a private individual."

Building Code Revisited

The Building Congress, the Building Trades Employers Association, and the Investment Builders Association have retained Brooklyn Polytechnic Institute to review the present New York City building code and see if it needs a partial or a complete revamping. This action was taken after Buildings Commissioner Peter Reidy and the Building Congress made separate recommendations to Mayor Robert Wagner that the Code be given an impartial review.

Charles E. Schaffner, Dean and Director of Planning at Brooklyn Polytech, said all interested groups, such as the New York Association of Consulting Engineers and the New York City Chapter of the

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Armco 50C Flap Gate, 60-inch diameter

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Armco Flap Gates now have new design features that permit even delicate adjustments after they have been installed—without disassembly.

Because these gates are equipped with new kinds of continuous studs, plus cast iron lugs and hinge arms, the two pivot points can be moved laterally from the wall to adjust the sensitivity of the gate. They can also be used to correct any slight misalignment in installation. Then too, extended ends of the links have set screws to permit further adjustment of the flap to the frame.

These cast iron Flap Gates are designed for 20- or 50-foot seating heads. Choice of spigot or flat back; cast iron or bronze seating faces; diameters range from 4 to 84 inches.

For more information on Armco Gates—flap, sluice, slide, roller, or radial gates—write us. Armco Drainage & Metal Products, Inc., 6311 Curtis Street, Middletown, Ohio.

Detail of hinge arm mechanism

ARMCO Drainage & Metal Products

American Institute of Architects, are being consulted for possible improvements of the Code.

Codes of a few other cities also are being studied for comparison. In addition, the new Concrete Industries Board code and the Fire Underwriters provisions are being investigated as possible models.

Texas Society Loses

A District court in Texas has dismissed a suit brought by the Texas Society of Professional Engineers against Dalton, Hinds & O'Brien Engineering Company, of Pasadena, Texas. The TSPE, charging the firm with misuse of the word engineering, and charging firm president R. G. McCauley with misuse of his registration, sought an injunction to have the company suspend operations.

In dismissing the case, the judge referred to 1957 legislation detailing how engineering firms should incorporate. Last year the Texas attorney general was asked for a ruling, clarifying corporate practice. He stated that "It is true that a corporation cannot get a professional engineer's license, but more to the point is the fact that a corporation is not *required* to obtain a license to do what is permitted by Section 17."

TSPE is requesting a new trial.

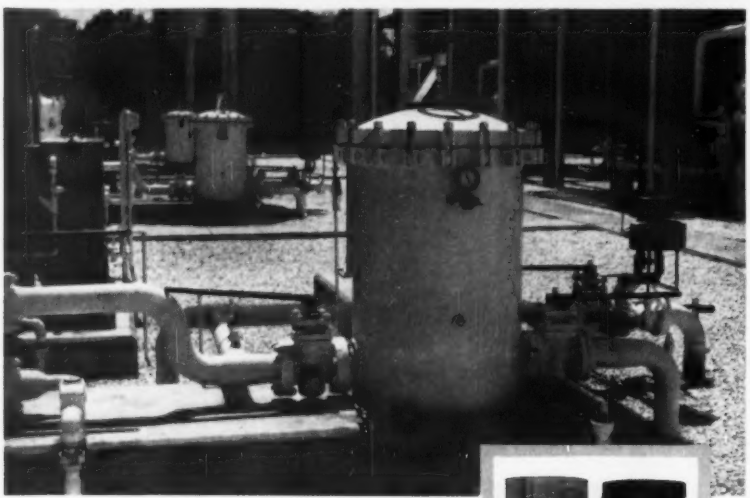
Montana Legislation

Three bills that were considered against the interest of the engineering profession failed to pass the Montana Legislature this year. All were opposed by the one-year-old Montana Technical Council, which is made up of representatives of the engineering and architectural professions.

One bill, which died in committee, would have required engineers and architects to take full responsibility for completed construction. This would have meant performance bonds for all engineers and architects doing state work.

Another bill had been introduced, which would have set up a five-man building commission, including one engineer and one architect as members. This commission would have concentrated all state building authority under one control, establishing construction priorities and retaining any needed architects or engineers. The Technical Council objected and submitted a substitute bill. This was changed so much by the Legislature that the Governor vetoed the idea.

Some time ago, the Montana State Highway Department entered into a union contract that covered many of the engineering personnel. The engineers objected, contending they were not allowed to vote. A bill was introduced to sanction various departments of the state entering into union agreements, thus insuring the validity of the Highway Department agreement. The Technical Council objected to this bill, and it failed to pass the Assembly. ▲▲



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Capitalizing on the extremely minute particle retaining ability of Nugent Disc Type Filters, the Houston Texas Gas and Oil Corporation Pipe Line has installed 12 lubricating oil filters along its line. Each filter protects a gas engine driven gas compressor by filtering all the lube oil every cycle. Dirt and contaminants are removed before they can harm expensive equipment.

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Fig. 1555D size 4L recharge and a clogged charge. Size particle retention . . . about 5 microns. Working pressure . . . 125 psi, tested at 375 psi. Maximum operating temperature . . . 375 F. Only foreign solids are removed . . . additives and dertergent oils are unaffected. 1061

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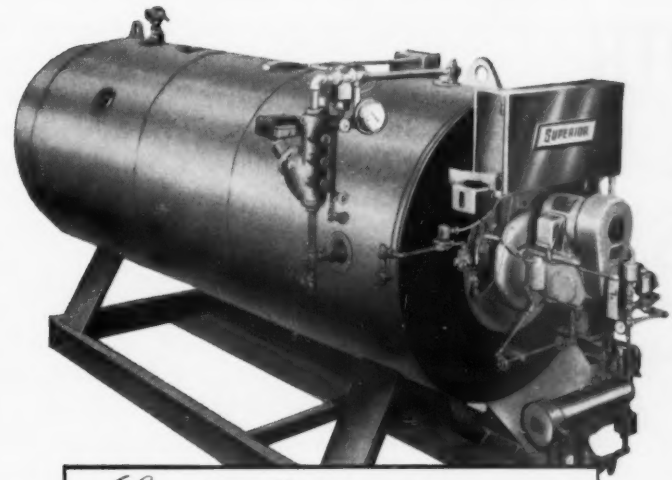

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The Merchandise Mart, famed showplace of Chicago, contains 93 acres of floor space, houses approximately 30,000 persons working for major national concerns that demand top service. The Mart recently installed 40 Westinghouse DS-3 dry-type transformers to reduce noise levels and improve tenant comfort and efficiency.

Transformer noise sounding through Chicago's vast Merchandise Mart doesn't plague tenants and visitors any more. Mr. James Clark, Electrical Foreman, tells why.

"When our local utility began supplying current at 480 volts, our transformers were just too noisy. They were located in the stair wells, and their noise was intensified by the echo-chamber effect of the surrounding concrete walls. Some of our tenants began to complain. We tested a Westinghouse DS-3 dry-type transformer which proved to be virtually noiseless and decided to install 40 units.

"We found a two-man crew could hang these lightweight transformers near the top of the wall on angle frames in a short time. This saved stairwell space and allowed us to locate the transformers nearer load centers. So we saved on secondary cable and improved voltage regulation.

"Our former transformers were top-connected with primary cable. Heat rise baked out the insulation and we were constantly replacing cable. Since the Westinghouse DS-3's are bottom-connected with maximum terminal compartment temperature of 50°C, this costly problem has been eliminated."

In addition, Mr. Clark reports that maximum safety — an important consideration in a densely populated building — is assured with Westinghouse DS-3 transformers. They are explosion-proof, eliminate the danger of fire and, in the event of failure, allow no possibility of toxic gas inundation.

Westinghouse DS-3 transformers can help you solve your transformer problems. Your nearest Westinghouse representative will show you how. Contact him . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

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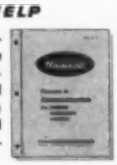

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The Legal Aspect

DR. MELVIN NORD
Registered Engineer
Attorney at Law

Corporate Practice . . . The Real Issues

WE ARE INFORMED that a bill or possibly several bills have been submitted to the legislature of the State of Washington to amend the Professional Engineering Registration Law.

As pointed out in the previous two articles in this series, there is plenty of room for improving all engineering registration laws: (1) to eliminate unworkable, unwanted, and unfair provisions (or implications) as to the effect of a violation of the statute, and (2) to provide a direct remedy for accomplishing what is actually required — enjoining the practice of engineering by unregistered persons.

However, these deep-seated problems, which have caused the Michigan and Ohio statutes to be declared unconstitutional, are not the subject of the present flurry of activity in the State of Washington. The problem here has been much more mundane. It is simply whether or not, or under what conditions, to allow corporate engineering practice. The reason the question has arisen at this time is that, unless the statute is amended, the present provision allowing corporate practice will automatically expire on December 31, 1961. This provision was placed in the statute in 1959, to last for two years only. Previously, corporate practice was not permitted, except that before 1947, engineering corporations were permitted to offer their services to the industries and utilities of the State of Washington. Thus, the law on corporate practice in the State of Washington has been virtually in perpetual motion.

Perhaps it would be more accurate to describe it as a state of perpetual emotion, in view of the current situation. At least two groups are understood to be circularizing the registered engineers of the State, asking for their support. Evidently both of them favor corporate practice. Both of them are against "discriminatory" legislation. Yet they each take pretty good swings at the other (unless they are swinging at some unknown third party) for being "discriminatory" — or something. The stationery of one group is lined with the names of persons, all of whom seem to have the same initials, i.e., P.E. The stationery of the other group is lined with the names of persons who are mostly presidents or managers of gigantic corporations which are understood to desire the right to continue to employ major engineering corporations having national reputations.

So far as can be determined from this (safe) distance, this comic opera battle is superficially over

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Yield Strength, PSI	———	45,000* Min.	36,000 Min.
Elongation, % in 2" Gage Length	NIL	15	22
Modulus of Elasticity, PSI	12—20x10⁶	24x10⁶	30x10⁶

*0.2% Offset

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the question of whether certain controls shall be placed over corporation engineering practice, or whether no such "discrimination" should be allowed to exist against corporations. Why anyone should be excited over this apparently trivial question is a question which makes one think (if nothing else will do it). After one has thought, one is impelled to conclude that maybe what is at stake is not really the academic question of how groups of Washington engineers shall be allowed to organize to practice engineering, but the dollars-and-cents question of whether Washington engineers will get the practice, or whether outside national firms will get the business. (Someone is bound to "get the business" in this situation.)

On the face of it, the group which wishes to allow corporate practice under certain restrictions (as to qualifications of the company and/or ownership of stock and/or provisions in the bylaws and/or other provisions which purport to place some individual responsibility on individuals in the corporation) is thinking of engineers residing in the State of Washington who wish to organize into firms to engage in engineering practice jointly. On the other hand, it seems quite clear that the other or "anything goes" group is thinking primarily of engineering firms located outside the State. If this is so, the first question which might be asked is, "How can nonresident engineers, whether corporations or not, be practicing engineering in Washington?" And the second question is, "Is there any legitimate reason why they should not?"

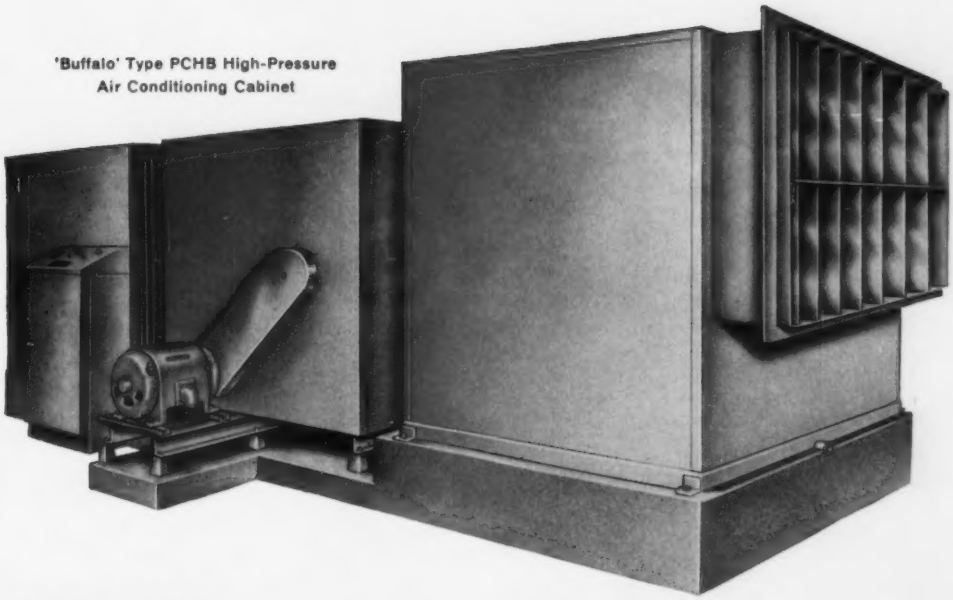
In other words, the issue in Washington does not really seem to be whether or not corporate practice ought to be allowed, but whether state boundaries should have any significance whatever with respect to engineering practice (particularly large-scale engineering practice). Is there any reason for having 50 sets of registration laws which unquestionably would inhibit large-scale interstate engineering operations if anyone paid any attention to them? (Every once in a while one gets fed up with states altogether, when one considers the world as it really is.)

This question really cannot be answered seriously before one makes up his mind just what legitimate (as distinguished from ostensible) purpose is served or can be served by engineering registration laws.

Are we worried, for example, about whether some national engineering firm (let's say a giant like Ebasco) is going to take advantage of a giant client such as, for example, Aluminum Company of America? If that is what we are worried about, we can stop worrying right now. A giant client has better ways of ascertaining the engineering ability of a giant engineering firm than the state board has; a written examination on college subjects is a pretty far cry from reality in such a situation. Thus, if we are worried about protecting the client, and the client is sore as hell at us for interfering with his business with the engineering firm of his choice, there is certainly an aura of surrealism in this. Why should we force such "protection" on someone who is dying not to be "protected?" If the object is to protect the engineering firm's client, this certainly can be accomplished by allowing him to expressly waive this right when he enters into an agreement with such a firm, being fully aware that he is not dealing with a "registered engineer" but with a giant engineering firm having exactly the qualifications he wants.

However, it is not really as simple as that. While it is trite to say that the "public at large" may have a stake in this, that does not necessarily make it untrue. If a structure, or a pipeline, or an electric transmission line, or whatnot, is so situated as to constitute a great menace to the public or to

'Buffalo' Type PCHB High-Pressure Air Conditioning Cabinet



NEW 'BUFFALO' HIGH PRESSURE UNIT FOR MULTI-ZONE OR DUAL-DUCT AIR CONDITIONING SYSTEMS

Embodying all the proven construction features that made 'Buffalo' low-pressure Zone Control Cabinets popular with the industry, these new 'Buffalo' Cabinets are designed to operate at static pressures up to 8″.

Check these quality features:

RUGGED, COMPACT COIL SECTION

- Husky tubular frame — removable panels counter flashed at all seams for minimum air leakage.
- Vertical or horizontal discharge models for minimum floor space or headroom requirements — no discharge elbow needed.
- Heavy-gauge zone dampers, stainless steel blade journals — zones individually sized for CFM requirements, for accurate adjustment of balancing dampers.

EFFICIENT TYPE BL FAN SECTION

- Isolated from filter and coil sections by flexible neoprene connections.
- Fan, motor and drive assembly rigidly held in permanent alignment by rugged integral structural channel base.
- Time proved Type BL Fan with characteristics of particular advantage in a high-pressure system: — high efficiency over broad operating range — low noise level — non overloading horsepower characteristic — steep constant rising pressure characteristic for minimum capacity change in switching from hot to cold deck operation — stationary inlet guide vanes for stable performance under adverse inlet conditions — low fan cutoff velocities eliminate need for bulky diffuser section, providing excellent coil velocity distribution with minimum coil wiping.

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

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Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

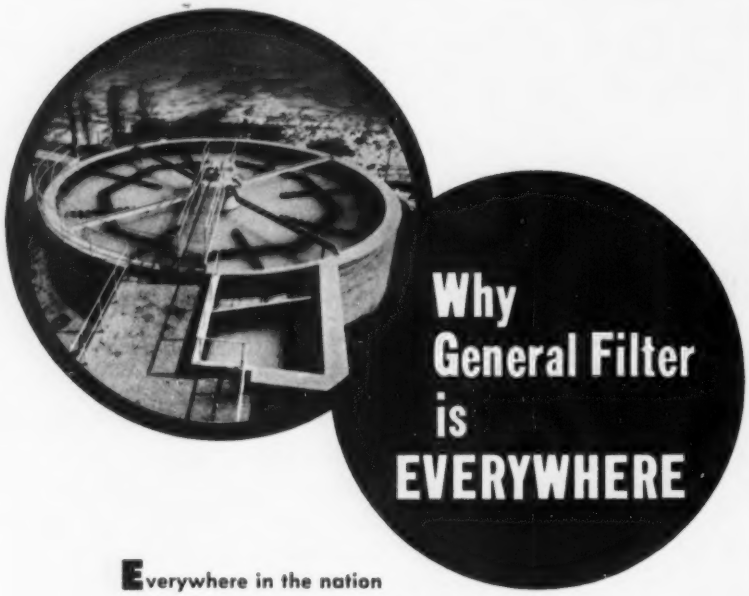
employees if it is not carefully built (and this is very often the case, even though catastrophes are fortunately rare in engineering practice), somebody must take care that the public safety is protected. In the case of individual engineers, or of small groups, the best way certainly would appear to be the conventional registration method, if this were made to function fairly and effectively. But in the case of mammoth projects, involving a great many engineers, there may be much better ways. In such cases, if the client wishes to go outside conventional registration methods in selecting his engineering firm, he should be allowed to do so, provided he can and will furnish for the benefit of the general public and the client's employees and visitors, financially responsible guarantees (not based on negligence or other fault) against injury to them arising out of any defect or failure of the structure. In turn, the client could require the engineering firm to indemnify it in a similar way. This could be much more effective than merely making sure that someone has passed a written examination which covers materials 90 percent of which have no bearing on what he is doing. For example, are we really satisfied to allow a nuclear power plant to be built next door, even if the "engineer in responsible charge" happens to be registered? (I'm not – if it's my house.)

Thus, we would be wise to take at face value the question raised by Judge Freeman in his decision holding the Michigan and Ohio engineering registration laws to be unconstitutional, i.e., "Who is to be protected by the statute – the individual member of 'the public,' constituting the client, or the 'general public,' constituting every person who may be injured by an engineering failure or inadequacy?" Until we think this problem through in a realistic and honest manner (and throw out any unworthy notions of using registration laws as a shield and buckler for engineers in keeping their business and in maintaining prices at a satisfactory level), we cannot solve this problem.

Unfortunately, there is good reason to think that the ratio of "public interest" to "self-interest" in most of these debates about engineering registration laws is shamefully low. What has happened to idealists in our time? Are they all too busy making money?

These thoughts (as the saying goes) do not exhaust the subject of the "Washington crisis," as there is a stupendous amount of room for detailed criticism on both sides.

If I receive no threatening letters in the meantime, I propose to pick these two positions to pieces in the next article in this series. In the meantime, how about just amending the Washington statute to read "December 31, 1964?" That will give us time to think. ▲▲



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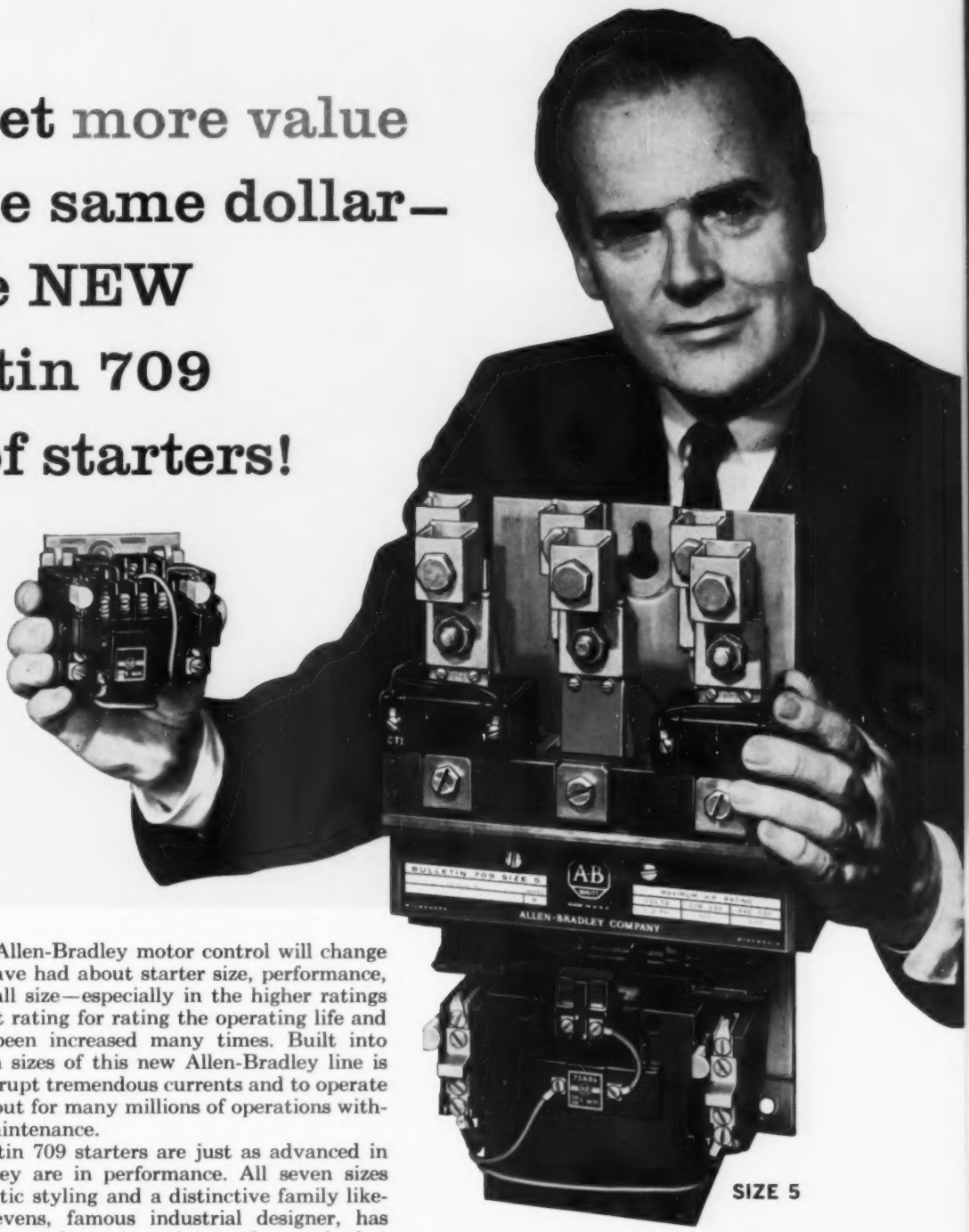
FLASH MIXERS • FLOCCULATORS • PNEUMATIC CONTROLS
ROTARY DISTRIBUTORS • SLUDGE SCRAPERS

You get more value for the same dollar— in the NEW Bulletin 709 line of starters!



SIZE 00

SIZE 5

This new line of Allen-Bradley motor control will change every idea you have had about starter size, performance, and life. The small size—especially in the higher ratings—is startling. Yet rating for rating the operating life and reliability have been increased many times. Built into each of the seven sizes of this new Allen-Bradley line is an ability to interrupt tremendous currents and to operate year in and year out for many millions of operations without trouble or maintenance.

The new Bulletin 709 starters are just as advanced in appearance as they are in performance. All seven sizes have an aristocratic styling and a distinctive family likeness. Brooks Stevens, famous industrial designer, has given the enclosures such an attractive, modern style that these new starters will prove a distinct sales asset on any machine or installation.

Why not write today for more information on this revolutionary new line of Allen-Bradley Bulletin 709 *quality* across-the-line motor starters?

Note the compactness of both the smallest and largest starter in the new Bulletin 709 line. Ratings up to 100 hp, 220 v; 200 hp, 440-550 v.

10-61-RM

ALLEN-BRADLEY

Member of NEMA

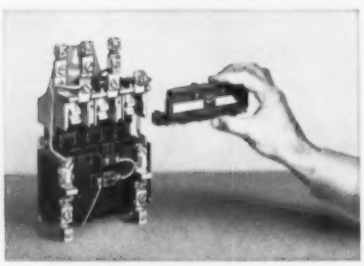
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

QUALITY MOTOR CONTROL

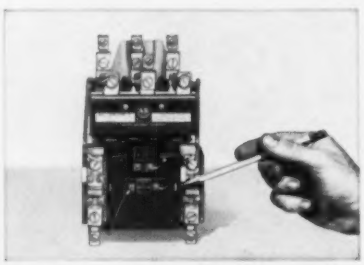
Features of the NEW Allen-Bradley starter line that are of value to you!

New Bulletin 709 Size 3 across-the-line motor starter. Note the generous space for wiring, accessible terminals, and white interior.

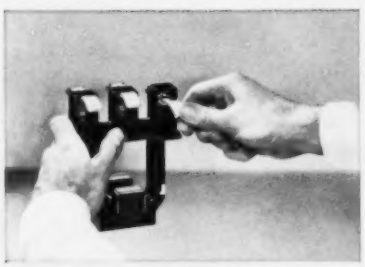
Every detail of the new Allen-Bradley motor starters has been designed to help make this the best line of motor control on the market. Remarkably small in size, each starter is a giant in performance. Being light in weight, these starters are easy to handle and a cinch to install. The generous wiring space, full front wiring, white interiors, and convenient knockouts make installation easy. The enclosure cover is firmly held with a quarter-turn fastener. All installation, inspection, and maintenance operations can be handled from the front—as shown in the illustrations below—without the use of special tools.



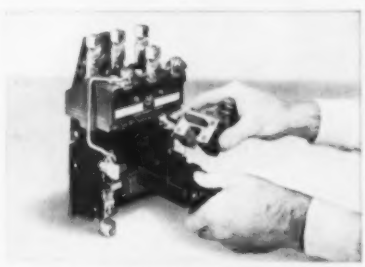
QUICK, EASY CONTACT INSPECTION—When the arc hood front cover is removed by loosening two captive screws, contacts are plainly visible from the front.



CONTACT POSITION INDICATED—Two slots in the coil cover show the position of the movable contact support—tell whether contacts are "closed" or "open."

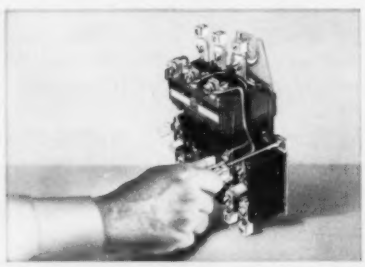


CONTACTS EASILY REPLACED—Depress the spring slightly, and the movable contacts can be lifted out of the molded support and the new contacts slipped in.



COIL EASILY CHANGED—When the coil cover is removed, coil and magnet yoke can be lifted out from the front. They are impossible to replace incorrectly.

AUXILIARY CONTACTS EASILY ADDED to the front of the starter. Two extra auxiliaries can be added to Sizes 0, 1, and 2 starters, and four, to Sizes 3, 4, and 5.



A THIRD OVERLOAD RELAY CAN BE EASILY ADDED in the field, from the front of the starter. And the only tool needed is a common screwdriver.

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QUALITY MOTOR CONTROL

PLATECOIL®

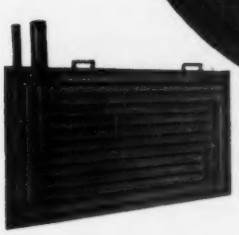
IS SOLVING MORE HEAT TRANSFER PROBLEMS THAN EVER BEFORE

New manufacturing techniques and facilities now make available a wider variety of shapes, forms and styles of TRANTER PLATECOIL—applicable to more tank and process heating and cooling and special heat transfer requirements than ever before.

A TRANTER PLATECOIL consists of two metal sheets, (one or both of which are embossed), spot welded and seam welded together to form channels for heating or cooling media. In addition to standard styles, PLATECOIL offers the design and development of specially formed PLATECOIL to meet specific application requirements.

Thousands of PLATECOIL applications to the heat transfer problems of the processing and manufacturing industries have saved users time and money on engineering, fabricating, installation and maintenance . . . out-performing other types of heat transfer equipment. "Platecoil" can be furnished to comply with ASME Code.

Ask for PLATECOIL® BULLETIN P85.



"Standard" Style 90 PLATECOIL with exclusive "MULTI-ZONE" design, for optimum steam distribution. Serpentine styles for cooling also available as standard.

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LANSING 9, MICHIGAN

PLATECOIL® DIVISION

The Word From Washington

EDGAR A. POE, Consulting Engineer Correspondent

Fresh Water Process

A new process for removing salt from sea water through freezing was described to a House Committee. "We know that this process will produce fresh water from the sea at a cost less than ever before achieved," Carlton Skinner, vice president of Fairbanks Whitney Corporation, told the subcommittee on irrigation and reclamation. Skinner, former Governor of Guam, was one of several witnesses who appeared before the committee to urge extension of the government's saline water program.

Skinner told the committee that he did not think the government should build further demonstration plants but that it should grant loans to cities for construction of conversion plants. Four of seven bills now being studied by Conthe saline water program.

Virgil C. Williams, a consulting chemical engineer from St. Louis, told the committee that he holds the patent on a hydrate process which could produce fresh water for less than 30 cents per thousand gallons in a 10 million gallon capacity plant. His estimate for the cost of water produced by the freezing process was 52 cents per thousand gallons.

More GAO Reports

The General Accounting Office plans, in reports scheduled for release later this year, to delve into the methods of contracting for consulting engineers' services, according to George Staples, associate director of the Civil Accounting and Auditing Division. The GAO earlier issued a district highway study report, recommending use of a cost-plus-fixed-fee instead of cost-plus-percentage.

The first in the series of studies of the state highway departments, covering Pennsylvania, Maryland, and West Virginia, was published two years ago. It won no popularity among consulting engineers because of its statement that "The use of consulting engineers results in additional cost to the states and the Federal government, by reason of the overhead and profit included in the fees normally charged by such firms."

Subsequent reports, prior to the study on Louisiana, Oklahoma, and Arkansas, made no mention of consultants. The Louisiana, Oklahoma, and Arkansas area study (Region 6) states that "We believe that a provision to pay costs and profit on a cost-plus-a-percentage-of-cost basis does not encourage efficient operation by the contractor and offers an incentive for contractors [consulting engineers with whom they were making a contract] to incur costs up to the maximum provided for reimbursement in the contract, inasmuch as increased costs bring increased profit. Most Federal agencies are prohibited by statute from making this type of contract with consulting engineers.

"We believe that consideration should be given by the Bureau to recommending that states use cost-plus-a-fixed-fee type of contracts . . . Under this method of contracting, the contractor is reimbursed for proper costs and receives a fixed fee for his profit. The fixed fee, once negotiated, does not vary with actual cost but may be adjusted as a result of any subsequent changes in the work or services to be performed under the contract. Federal agencies generally recognize cost-plus-a-fixed-fee type of contracts as appropriate for use where the scope and nature of the work to be performed cannot be definitely specified, and this method of contracting would appear to be equally appropriate for use by the states under similar circumstances."

GAO also came out against fees being mentioned prior to negotiations. "Contracts with consultant engineering firms in Arkansas were generally based on a proposal, circulated among consultants, that set forth the amount or the percentage rate of estimated construction costs that the state was willing to pay for the services. Competitive solicitation of bids for these types of services is not considered appropriate by the Bureau. We believe, however, that, within this policy of not soliciting bids for professional engineering services, it

Architects and Engineers:
Johnson and Johnson, Inc.

02

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3200-FOOT CONVEYER SYSTEM MOVES 500 TONS OF ROCK PER HOUR

This vast conveyor system is an example of how Planet Corporation achieved its reputation as a *versatile* organization . . . an organization capable of building all types of materials handling systems and automation equipment from large capacity bulk handling systems to intricate, custom designed production systems.

The 3200-foot conveyor system partially shown above was installed by Planet at a large cement plant. It moves 500 tons of 4½-inch maximum diameter limestone rock per hour on 30-inch wide covered troughed belt conveyors. The longest continuous-belt conveyor (shown in background) is 803 feet long . . . and, except for a few feet at the loader hopper, *it is elevated all the way.*

If you have a materials handling, production, or automation problem, let Planet demonstrate how "PV" . . . *Planet Versatility* . . . will save time and money in finding cost-saving, efficiency-increasing solutions. Write or phone today . . . you'll find *it pays to plan with Planet.*

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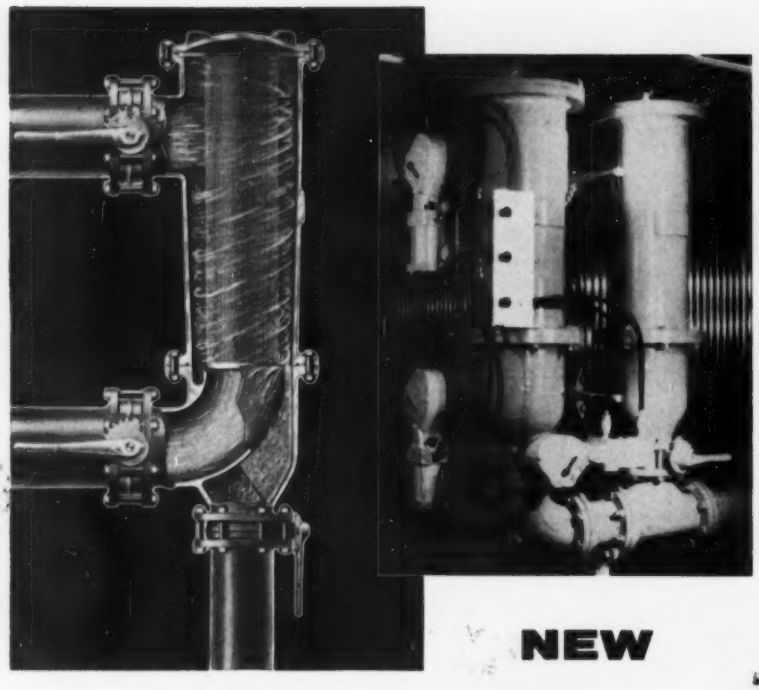

NEW

PRATT Cyclone Strainer ...multiple unit concept solves many strainer problems

This unique new strainer utilizes a simple, powerful cyclone-like action. Water moves from the outside to the inside of the strainer basket with a vigorous downward swirling action, keeping larger particles from the strainer basket and forcing them toward the trash outlet. The Cyclone stays "on the line" longer, requires less space, less installation cost and less maintenance than any similar unit.

COMPACT MULTIPLE UNITS to meet any flow requirements or any reasonable pressure drop. Multiple units are completely adaptable to space limitations and can easily be added for plant expansion.

BACKWASHING is simple and can be completed in seconds. Automatic or manual controls are available.

EQUIPPED WITH MONOFLANGE MARK II RUBBER SEAT BUTTERFLY VALVES—only one-quarter turn required. These are the only moving parts on a Cyclone Strainer.

A detailed bulletin especially useful for Consulting Engineers, contains head loss and flow rate data and typical arrangements. Ask for Bulletin S-1-J

Cyclone STRAINER

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Creative Engineering for Fluid Systems

would be entirely proper to circulate proposals among consultants without any stipulations as to the amounts or percentage rates of fees that the state expects to pay and that, upon receipt of replies from interested consultants, a selection should be made from among qualified firms after negotiation of the fee. The practice of a state's making what constitutes an offer of price for the work could result in a fee that is more than that which would ordinarily be charged by the consultant. Regional officials agreed that it may be possible to obtain lower fees from an acceptable consultant if the state's estimate of the fee were not included in the proposal. The matter is to be discussed with the state."

GAO also found, in Arkansas, insufficient information about how the consultants were computing their fees. However, the report noted that the Bureau of Public Roads recently revised operating instructions to "satisfactorily resolve this matter."

Air Pollution

The Bureau of Mines, cooperating with the Public Health Service in air pollution research, asserts in a recent annual report: "Favorable preliminary cost estimates for a Bureau-developed method of removing sulfur dioxide from flue gases led to design and construction of a pilot plant for testing the process further. The Bureau's delineation of relationships between automobile fuels and exhaust compositions attracted interest from many concerned with air pollution research. Bureau work on both catalytic and flame afterburning of exhaust gases assumed increased importance with more general acceptance of the automobile as a major factor in urban air pollution."

Change for Government Engineers

A bill has been introduced in Congress that would make the lowest salary for a beginning government

IMPORTANT ANNOUNCEMENT

to people who hear voices*

*voices that intrude or disrupt and noises that project when they should be hushed.

The new Aircoustat® Model W Return Air-Vent Silencers stop the transmission of noise without blocking air flow

Aircoustat Return Air-Vent Silencers eliminate the distracting sound of voices that spill from one area to another. Their slim design gives you a choice of installation. You can install them within a wall or ceiling or hang them on doors or walls. Let Koppers long experience in sound control help you. Write today for information to: KOPPERS COMPANY, INC., 3605 Scott Street, Baltimore 3, Maryland.

Model W Return Air-Vent Silencer

In sizes for all applications:

Model	Thickness	Width	Length
W-1	3½″	30″	48″
W-2	3½″	42″	48″
W-3	5″	30″	48″
W-4	5″	42″	48″
W-5	7″	30″	48″
W-6	7″	42″	48″

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IRVICO Gratings are made in an exceptionally close mesh with bearing bars spaced ¼" face to face.
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New frontiers in grating design

The many new uses for grating that have been developed and are being explored require an increasing number of mesh designs and sizes. IRVICO now produces 147 different mesh designs for an enormous variety of industrial, architectural and decorative applications...with more to come for new uses and conditions.

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engineer $6400 a year, which is considered "comparable to current rates for similar classes of employees in nongovernment employment." This would mean that consulting engineers in small towns will have an even more difficult time getting college graduates, unless they are willing to pay the minimum wage.

The bill, by Anfuso of New York, would place all government engineers under Civil Service.

One good point of the bill: two years from the effective date of the act, no person could be appointed, promoted, or transferred to the new salary schedule unless he is an engineering graduate, a registered engineer, or an engineer-in-training.

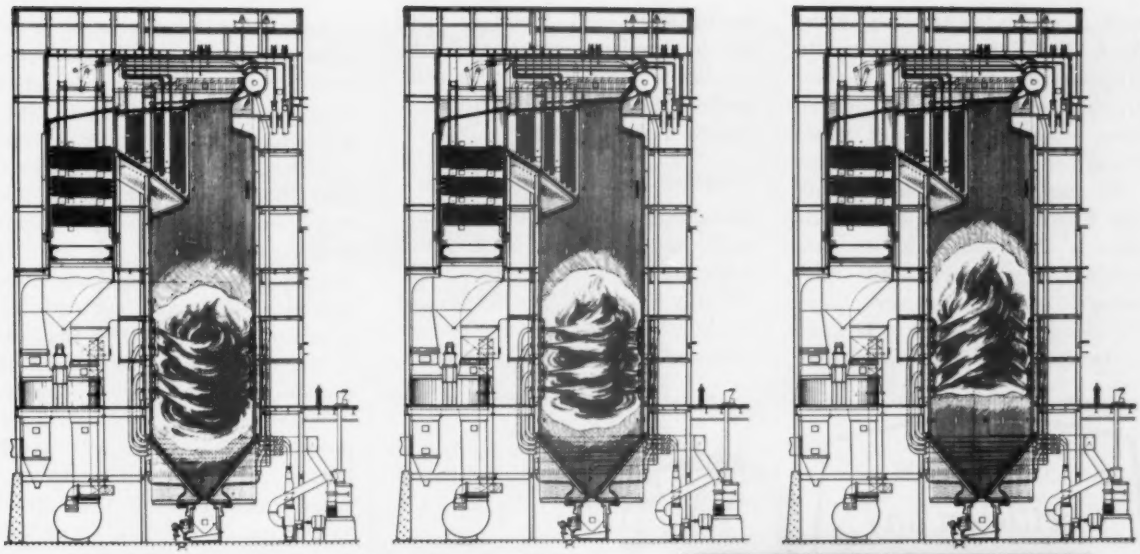
Cut Down Driving?

Mayor Anthony Celebrezze, of Cleveland, warns that big cities some day may be forced to bar commuters from driving to work — to avoid snarled traffic and parking tie-ups. "The day may come when you have to draw a circle around the downtown area and say, 'This is as far as you can come,'" he told a Senate Housing Committee. Celebrezze, one of several witnesses, testified in favor of legislation proposing low cost Federal loans to help improve urban mass transportation systems.

Sen. Prescott Bush, Republican of Connecticut, prompted Celebrezze's observation when he said improved mass transit systems would do no good if many commuters still elected to drive. Bush conceded it was "an ugly thought," but suggested that the situation could become so desperate that cities might have to levy taxes on incoming cars or devise "some sort of discipline, to help correct the situation."

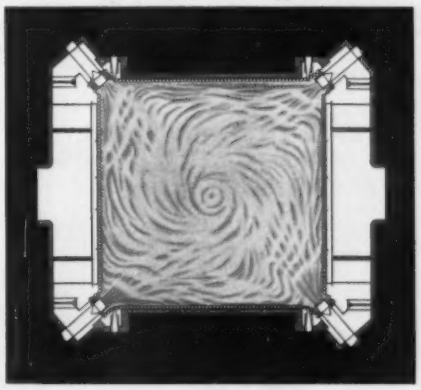
Water Losses

The Bureau of Reclamation has expressed growing engineering concern over the loss of water through seepage in its vast net-



HOW C-E TILTING TANGENTIAL BURNERS CONTROL SUPERHEAT.
First diagram shows burners tilted downward to reduce furnace outlet temperature. Middle diagram shows normal operating position. Third diagram shows upward tilt to send higher temperature gases to superheater.

C-E TANGENTIALLY FIRED BOILERS



Plan view of tangentially fired furnace shows how action of fuel and air streams sets up extreme turbulence for thorough mixing and complete combustion.

give more complete combustion... most sensitive steam temperature control

Tangential firing – pioneered by Combustion in 1927 – is today the most widely accepted method of firing pulverized coal, gas or oil, separately or together, in large utility boilers. Air and fuel are fed to the furnace in a number of relatively small streams which are directed from each of the four corners of the furnace.

This assures intimate mixing and sets up a strong turbulent motion within the furnace . . . to produce the most complete combustion with minimum carbon loss. The combustion gases fill the furnace for more rapid heat transfer to the waterwalls.

The tilting nozzles of C-E Tangential Burners automatically tilt up or down as steam temperature varies. If steam temperature goes too high, the nozzles tilt downward . . . more furnace wall surface becomes effective . . . gas temperature to superheat surface is lowered . . . steam temperature goes down. Or, if steam temperature drops, the nozzles tilt upward . . . hotter gases go to the superheater . . . steam temperature goes up.

Catalog PC-8 gives full information on tangentially fired C-E boilers, including units with capacities as low as 70,000 lb of steam per hour. Write for your copy today.

COMBUSTION ENGINEERING

C-E

C-304A

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ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

work of canals, particularly in the West. The Bureau is engaged in programs to make conservation structures more efficient and develop ways to cut water waste through evaporation and seepage.

The Bureau reports that significant improvement has been made through development of standard designs for noncylindrical prestressed concrete pressure pipe. The design is expected to be used in the conveyance of water under moderately high pressure and should, under certain hydraulic conditions where this pipe is competitive, lower costs for irrigation, pipelines and conduits.

Overtime Instead of Consultants

Instead of using consulting engineers in Bureau of Reclamation work, Commissioner Floyd E. Dominy has placed the design and specifications staff in his Denver office on a six-day, 58-hour week.

An Interior Department press release explains that "This acceleration, aimed at awarding all contracts possible before June 30, 1961, will affect a large number of construction and operation projects throughout the West. Since the items involved vary from small procurement orders for supplies and equipment to major construction activities, many levels of the economy will be affected. Because of the wide geographic spread of Bureau of Reclamation suppliers, it is anticipated that a significant portion of the orders will be of benefit to depressed industrial areas. Records show that about 55 percent of reclamation project costs are for manufactured goods made east of the Mississippi River.

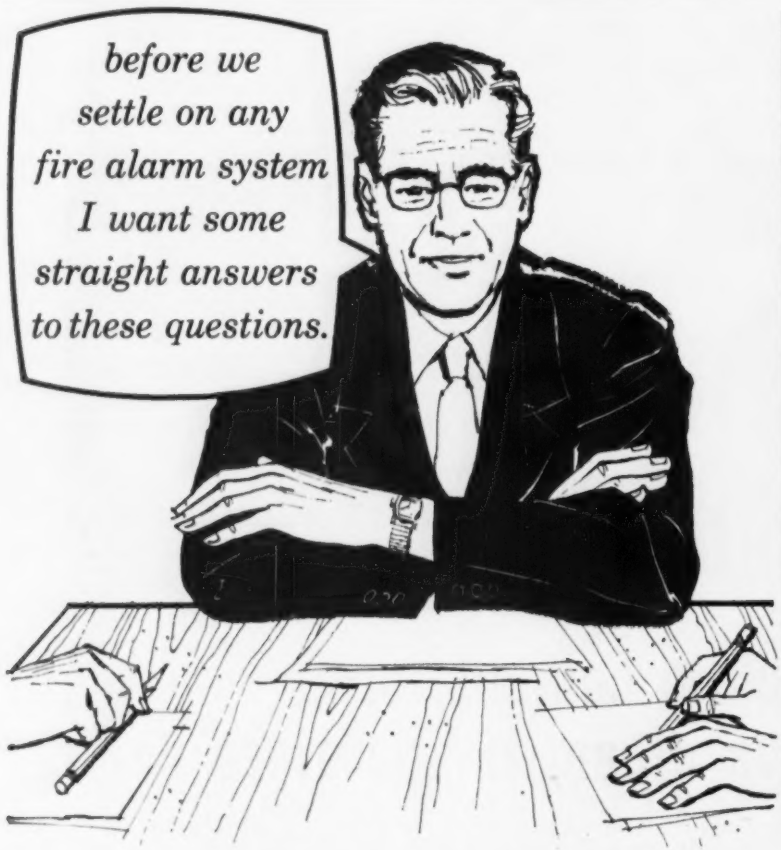
"The expedited work program in the Denver office will affect approximately 600 employees. They will work a 10-hour, five-day week with an additional eight hours on Saturday until such time as the backlog of designs and specifications necessary to push an expedited construction and procurement program is taken care of.

"The seven regional offices of the Bureau of Reclamation also have been directed to give highest priority to accelerating the award of government procurement, construction, and related activities. Overtime work will be undertaken in these offices also where necessary," Commissioner Dominy said.

The Commissioner told the National Society of Professional Engineers, at the Denver meeting last October, that "I also hope to persuade you that performance of major engineering work by government forces is necessary to accomplish the responsibilities placed upon the Bureau by Congress."

Common Situs Bill

The "common situs" picketing bill before Congress appears to be shaping up as one of the most bitter legislative proposals of the year. The AFL-CIO building trades unions are doing all they



- Will it automatically detect fires or does someone have to first see the fire or smell the smoke?
- Will it automatically sound the alarm or does someone have to pull a rope or lever to signal the danger?
- Will everyone be able to hear the signals in all parts of the building?
- Will the system automatically call the fire department, or must someone try to reach the fire station by phone?
- Will the fire alarm system automatically tell us (and the fire department) if and when it isn't working... or do we just assume we're still protected?

Questions like these deserve **straight** answers. Precious lives are at stake.

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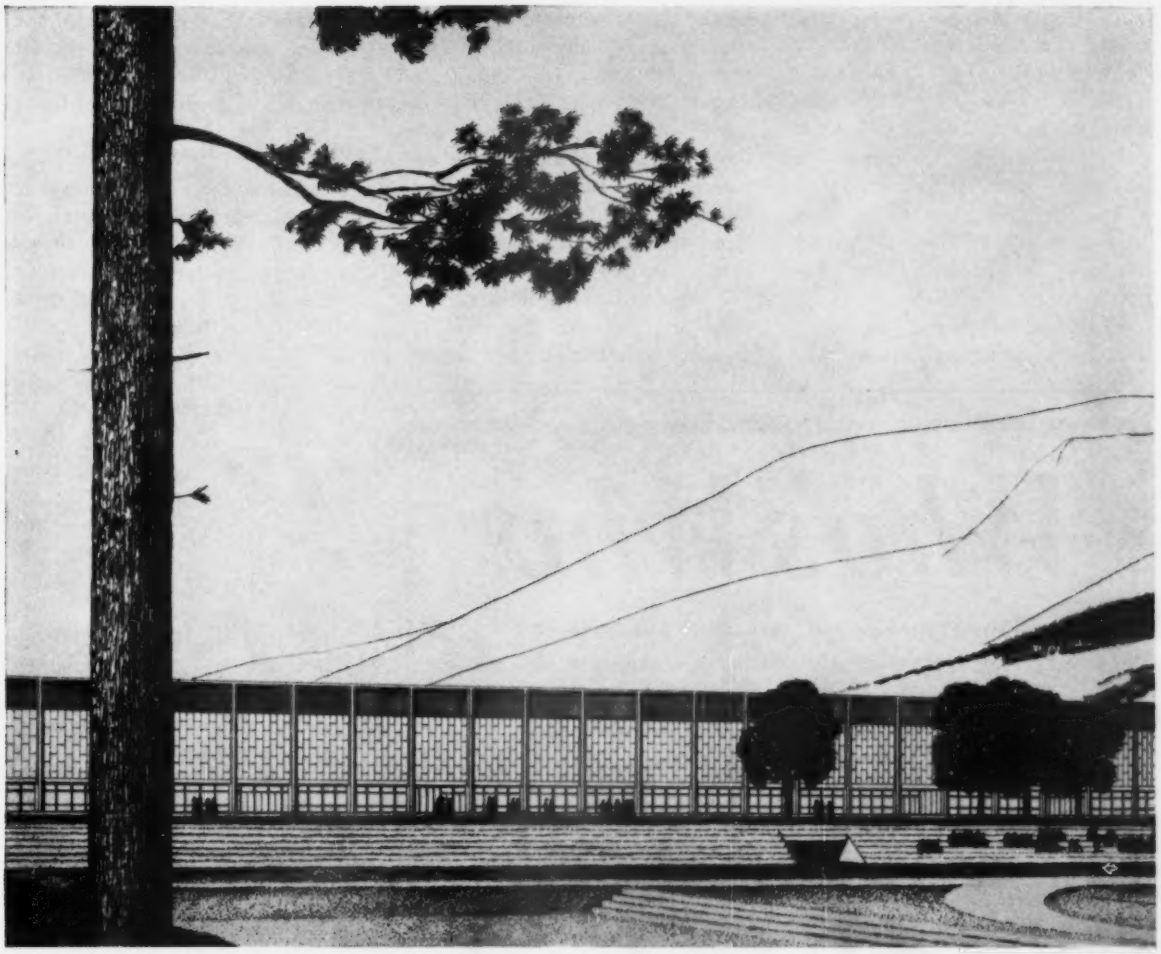
SALES OFFICES IN PRINCIPAL CITIES



Windswept U.S.A.F. Academy, Colorado, installs 3 miles of trim Crane Sunnywall Finpipe Radiation. Gets maximum heat output with minimum space sacrifice. Unobtrusive styling integrates with the clean modern architecture.

Sunnywall type N was chosen because of its compact efficiency. Because of its flexibility. Because its attractive, modern lines are built to last. Even excessive heat won't buckle or bend its expertly die-formed, heavy gauge steel covers.

Just about the most complete line of finpipe radiation available, Sunnywall provides a wide choice of quick-fit enclosures and easy-to-install accessories. This makes all the difference when time and labor costs are added up.

There's a choice of heating elements too. Economical steel — or superb non-ferrous elements with finest grade aluminum fins bonded to seamless copper tubing. All fins are permanently sealed to the pressure tubes for utmost durability.

For comfortable, clean convection heating with forced hot water or steam systems . . . for unmatched flexibility . . . for apartment or commercial building—specify Sunnywall by Crane.

See your regular contractor or your Crane representative for more details. Or write to Crane Co., Plumbing-Heating-Air Conditioning Group, Box 780, Johnstown, Pennsylvania.

AT THE
HEART
OF HOME AND
INDUSTRY

CRANE

VALVES AND PIPING
ELECTRONIC CONTROLS
PLUMBING
HEATING • AIR CONDITIONING

can to get the measure passed. The construction industry is strongly opposed to it.

The bill, backed by the administration, is sponsored by Senator Pat McNamara, Democrat of Michigan, and Representative Frank Thompson, Jr., Democrat of New Jersey. In effect, it would overrule the United States Supreme Court.

In 1951, the Supreme Court held that union picketing of one subcontractor at a construction site, thus shutting down the whole works program, was wrong and illegal. The court held that the refusal of other employees to cross the picket lines of a particular subcontractor at a job site constituted a secondary boycott, and thus was illegal under the Taft-Hartley Act of 1947.

Unions are not prohibited from picketing, provided the picketing does not have the effect of secondary boycotts. The unions are maintaining before Congress that the secondary boycott prohibition should not apply to construction.

Interstate Highway

There is a rough road ahead for the Kennedy Administration's plan to raise additional highway revenues for the Interstate System.

Senator Albert Gore, Democrat of Tennessee, a member of the Senate Finance Committee, is among the many members of the Senate and House opposed to the plan. Senator Gore calls for using vehicle and accessory excise taxes now going into the general Treasury funds to keep the Interstate program on schedule. Numerous Congressmen declare that the plan is politically unwise.

The American Road Builders' Association and the Associated General Contractors of America back the plan. President Kennedy is advocating keeping the present four cents a gallon Federal tax on gasoline; increasing the diesel fuel tax to seven cents a gallon; taxing trucks over 26,000 pounds $5 per thousand instead of the present $1.50; and raising the tax on tread rubber and inner tubes.

New Policy on Contractors

The Department of Defense has rescinded a directive, issued in 1957, which provided for withholding 20 percent of costs incurred by contractors performing certain categories of cost-reimbursement contracts until they had delivered end items or performed specified work.

According to the DOD report, "Criticism of the withholding policy centered around the fact that contractors were, in many instances, forced to borrow in order to fund the 20 percent of costs which the government withheld. The interest charges on these loans were an added expense to the contractor and hence entered into determination of his fee – and added cost to the government."

Who's Who in Certified Ratings?

The first edition of "Who's Who in Certified Performance Ratings" is now available to users and specifiers of air moving equipment. This new publication of the Air Moving and Conditioning Association meets the recognized need for an official directory of manufacturers and products licensed by AMCA to use the Certified Ratings Seal.

The 54-page directory contains essential product identification data on all air moving devices which have been tested and rated for performance in accordance with the rigid requirements of the AMCA Certified Ratings Program. Revised issues will be published periodically.

Copies of Bulletin 261A, "Who's Who in Certified Performance Ratings" are available from: Air Moving and Conditioning Association, Inc., 2159 Guardian Building, Detroit 26, Michigan.

GUTH GATEWAY

A winning combination of rugged strength, beauty and efficiency in a concave plastic fixture! The Gateway introduces a new concept of design and construction. Plastic is basic . . . but no wrap-a-round. Concave bottoms hinge separately . . . choose GrateLite Louver Diffuser* or Prismoid GrateLite Louver-Lens**.

100 FC AT 4 WATTS PER SQUARE FOOT!

the most efficient, most rugged, concave-plastic drop luminaire available

Examples — Estimated Ft. Candles — 80/50/30 R. F. — 9′ 0″ to 9′ 6″ Mtg. Ht. — 10′ 6″ to 11′ Ceil. — Row Mtgs.

with Concave PRISMOID					with Concave GRATELITES				
Rows of lamps	Room Index				Rows of lamps	Room Index			
	D	C	B	A		D	C	B	A
2-lite	52 FC	59 FC	67 FC	71 FC	2-lite	48 FC	54 FC	62 FC	66 FC
3-lite	78 FC	89 FC	101 FC	107 FC	3-lite	72 FC	81 FC	95 FC	99 FC
4-lite	99 FC	113 FC	129 FC	136 FC	4-lite	91 FC	105 FC	118 FC	125 FC

Notes: Room index D is for 30′ x 36′ room using 3-28′ rows
Room index C is for 40′ x 48′ room using 4-40′ rows
Room index B is for 50′ x 56′ room using 5-48′ rows
Room index A is for 60′ x 60′ room using 6-52′ rows

Guth LIGHTING since 1902

THE EDWIN F. GUTH CO.
2615 Washington Blvd., Box 7079, St. Louis 77, Mo.

* ® U.S. Pat. No. 2,745,001 Can. Pat. 1957, No. 538,245 ** ® U.S. Pat. No. 2,904,673

***KILLARK XMCS MOTOR STARTER**

. . . with important features found in every Killark enclosure of this type. Copper-free aluminum casting, ribbed for added strength and faster heat dissipation. Split box design provides easy accessibility, simple wire pulling. Surfaces precisely ground for tight fit. Guarded start-stop and reset buttons; front operated. Ideal for compact switch rack mounting. U.L. and C.S.A. approved.

Killark motor starters are available in manual or magnetic styles, single or two speed; reversing, special and combination. Sizes 0 through 5. Models for explosion-proof, dust-tight, weather-proof installations.

Superior performance is also provided by Killark disconnect switches, circuit breakers, panel boards and other large enclosures. Write for the Killark catalogs.

4028

Each new Killark design takes final shape on the drawing board only after extensive field tests, on-the-job surveys, and consultations with electricians and contractors. By combining actual user experience with their own engineering skill, Killark is able to produce electrical fittings and fixtures that consistently give better performance.

All-aluminum construction is another reason why Killark enclosures operate with greater efficiency. Fittings and fixtures made from this lightweight metal dissipate heat much more effectively, allowing thermal devices to function accurately. They're non-magnetic and non-sparking. They resist attack by rust and corrosion that causes malfunction and breakdowns.

"A Killark enclosure provides unmatched performance because you helped design it!"

Killark

ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves. *St. Louis 13, Mo.*

In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave. South, Toronto 18, Ont.

Acme... the **practical** approach to air conditioning

Consulting Engineer: CONSENTINI ASSOCIATES

Mechanical Contractor: KELMANARD CORPORATION

Modernizing Problem Solved with Acme

Modernization plans for New York's Hotel Beverly . . . in addition to redecorating from top to bottom . . . called for replacing window coolers with a more efficient, year around central-type comfort conditioning system. In the absence of space for equipment in the basement or on the roof, a "decentralized" system, using individual packaged chillers for each two floors was decided upon. Fine . . . except that spaces allotted for these chillers were confined (roughly 6′ x 6′) and adjacent to bedroom areas.

Problem: Finding chillers of required capacity small enough to fit the spaces, quiet enough to eliminate guest-disturbing noise. *Solution:* Acme Packaged Chillers . . . chillers that are more compact, lighter-in-weight (up to 40%) per ton of capacity than any other units on the market today. And quiet? According to the mechanical contractors, "The 'whisper quiet' operation of Acme chillers has lived up to reputation."

Acme's space-saving design and light weight also resulted in the selection of Acme cooling towers for this job. Two of them, 100 tons each, were hoisted outside the building and installed in a confined space on the 19th floor of the Beverly.

At the halfway point in the program (when the picture at left was taken) the many benefits of modern air conditioning . . . greater comfort for guests, increased operating efficiency, simplified maintenance, etc., . . . were already paying off. And a gratifying "fringe benefit" had become apparent, too . . . i.e., note, from the 12th floor up, the vastly improved appearance of the building.

Thinking of modernizing? Think of Acme!

Acme INDUSTRIES, INC.

JACKSON, MICHIGAN • GREENVILLE, ALABAMA

Manufacturers of quality air conditioning and refrigeration equipment since 1919

Packaged Chillers 1½-250 tons | Remote Room Conditioners 200-600 cfm | Cooling Towers 3-120 tons | Packaged Air Conditioners 3-60 tons | Evaporative Condensers 10-110 tons | Air Handlers 665-47,000 cfm

"Quote . . . End Quote"

Science in Politics

"Scientists in politics share the problems of other participants in the political process. No special dispensation spares the scientists from the hard choices and continuing difficulties which the political process imposes upon all those who aspire to shape public policy. They must establish legitimacy either for the spokesmen of a unified science community, or for the spokesmen of separate groups of scientists. Whichever they do, they must recruit allies from among organized groups of nonscientists; the scientists cannot exercise a unilateral dominance in formulating science policy. Alliances are created and maintained at a price; the price takes the form of mutually acceptable accommodations in policy or priorities . . .

"The scientists are now inescapably committed to politics . . . The leaders of the scientists, then, are perforce politicians. As politicians in a democratic order they are effective in the degree to which they understand the political process, accept its rules, and play their part . . . in the process with more candor then piety . . .

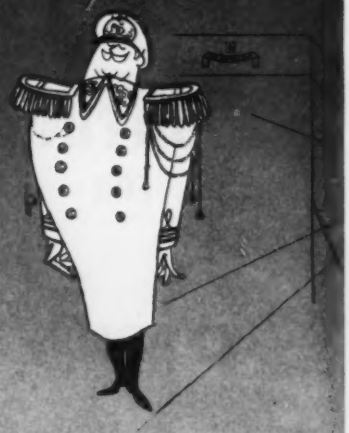
"The spokesmen of science have occasionally lectured the nonscientists, sometimes sternly, upon their obligation to understand science. Perhaps the advice may be returned: the scientist has an obligation to understand and to play his significant role forthrightly in the polity." — William S. Sayre, in an address, Annual Meeting, *American Association for the Advancement of Science.*

Embassy Building Flop

"What is known to French speakers [in Rabat, Morocco] as the 'folly of l'Oncle Sam' seems to be nearing completion after long delays. It is the new United States Embassy overlooking the Oued Bou Regreg, the little river that separates Rabat from its white twin city of Sale, where Robinson Crusoe was shipwrecked for the first time.

"One of the problems that held up construction was nobody's — or everybody's — fault.

"The site commands the finest view of Rabat. It overlooks the long green-brown valley of the Bou Regreg as it opens out to the Atlantic. After construction was well under way, someone noticed that the plans drawn in Washington provided no windows to exploit the view. The building was to be sealed and air conditioned, as if designed for the rigors of the Sahara instead



Pompous?

OH, NO SIR! PROUD!
Proud to be associated with New York's new, elegant Dryden-East. The decor is discreetly lavish. Rooms are extraordinarily large, luxuriously appointed.

Naturally, every room has individually controlled air conditioning, color television, FM radio, extension phone in bathroom, its own private cocktail bar. And may I venture to say, sir, the personalized service is unparalleled.

Welcome, sir—and madame—to

New
DRYDEN-EAST
Hotel
39th Street, just East of Lexington Ave., New York 16

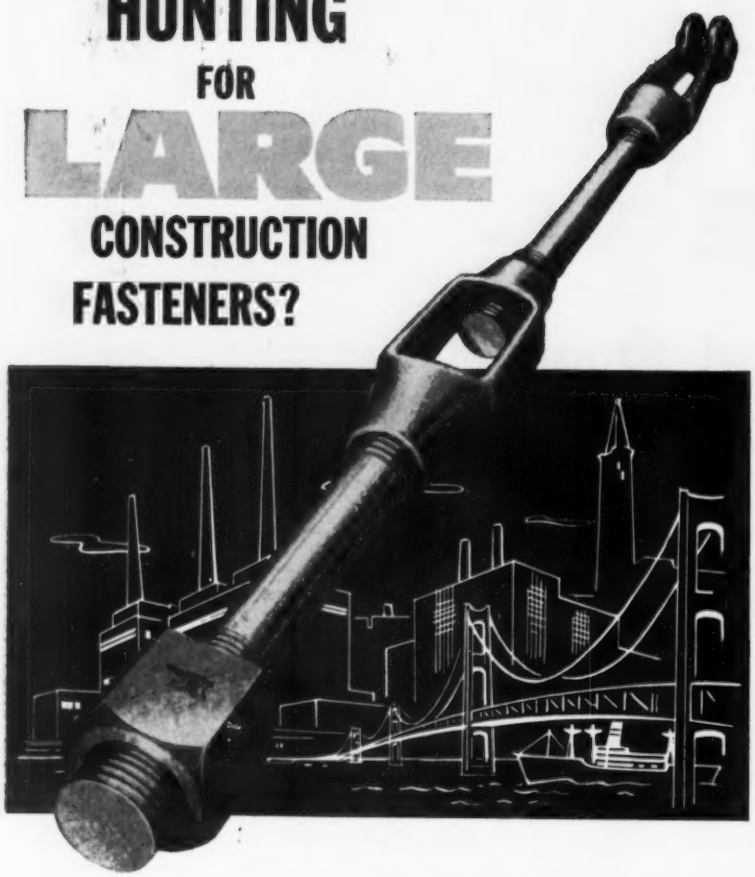
Tariff from $15 to $60 daily.

Several executive suites suitable for large companies as a year round city apartment.

Robert Sarason, *General Manager*

Teletype NY-1-4295

HUNTING FOR LARGE CONSTRUCTION FASTENERS?



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- Made by skilled craftsmen, specializing in standard and custom made fasteners, 1¾ inch bolt diameter and larger, engineered to your requirements.
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Every engineer needs this free digest of large fasteners. Write for Bulletin 160, Joseph Dyson & Sons, Inc., 5155 St. Clair Ave., Cleveland 3, Ohio, Phone HE 1-6157.

of for the temperate climate and charming landscape of the Moroccan seacoast.

"There were hasty conferences and exchanges of coded messages. Finally, the plans were redrawn to eliminate the air conditioning and open the walls to give American diplomats a view of the horizon. The change provided contractors an escape from penalty clauses for overdue completion.

"The embassy was expected to cost about $1.25 million, but the bill now has reached nearly $1.75 million. The original completion date was December 31, 1959, but it has been postponed frequently, and new hopes are focused on early summer.

"Former Ambassador Charles Woodruff Yost left last Sunday to assume his new post as Adlai E. Stevenson's deputy at the United Nations. His successor, as yet undesignated, will be the first to occupy the building and the residence that adjoins it.

"The building has drawn criticism from Moroccan Government quarters and inspired polite amusement in the foreign diplomatic colony. In conversation, Americans speak of it as 'the New Jersey cold storage plant' or 'our new ice house.'" — *The New York Times*, March 11, 1961.

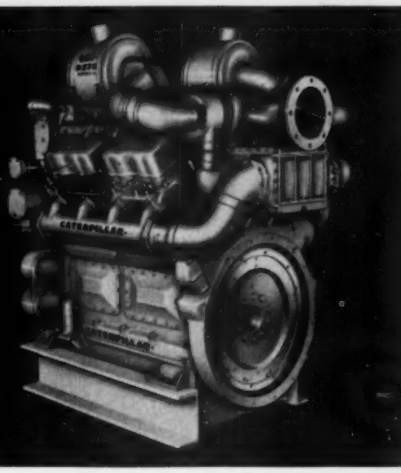
An Engineer's Peace Corps?

"The role to be played by individual engineers [in the peace corps] is not clear. However, there is a need for competent judgment as plans for more technical assistance take shape, and engineering judgment belongs in the picture.

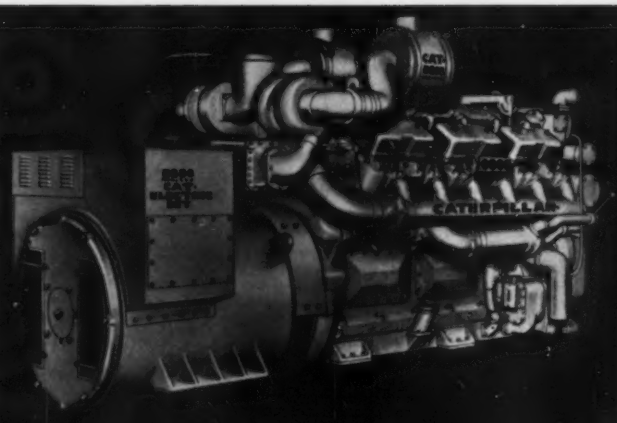
"Perhaps too much emphasis thus far has been placed on youth in the peace corps. There is, at the other end of the age spectrum, a great and growing reservoir of talent in engineering and in other fields as well. I refer, of course, to those who have newly entered retirement. Many are vigorous and eager to keep busy. Their enthusiasm and skill could well be

engine power BY CATERPILLAR

new Cat D398-D379



Cat D379 Industrial Engine. The 6.25" bore, 8.00" stroke D379 and D398 both offer the latest in attachments including marine gears and generators. The D379 Electric Set develops up to 350 KW continuous, 400 KW standby.



Cat D398 Electric Set. The D398 Electric Set shown here with Static-Regulated, Static-Excited Generator features a new generator with built-in static excitation system with no exciter generator or vibrating parts. Develops 500 KW continuous, 600 KW standby.

Give more horsepower per pound, per dollar than any other industrial engine in their class

The V12 D398 and the V8 D379 are rated at 950 and 630 maximum HP, respectively. Electric set versions reach to 600 and 400 KW. Marine ratings exceed 1000 HP. These engines are now available at prices that are less than crankshaft replacement prices of some competitive engines in their class.

Published list prices show the D398 to be thousands of dollars less than the next lowest priced industrial engine that will develop comparable horsepower. Other advantages are quality aluminum alloy bearings, aluminum pistons with cast-iron ring band for top two compression rings, drop forged-dynamically balanced crankshaft and high strength rigid block. These engines save in space and weight, too . . . with at least 35-40% less size and 4800 pounds less weight than other makes with comparable horsepower.

Here are more reasons why Cat D398 and D379 Diesels and Electric Sets give you extra value

NEW PERFORMANCE STANDARDS

- Turbocharged-Aftercooled design
- Static-Regulated, Static-Excited Cat Generators
- High flow lube and water systems
- Ability to burn wide range of fuels

NEW ENGINE FLEXIBILITY

- 100% HP from either end of engines
- Six available accessory drives – up to 50 HP each
- Controls available for either side
- Standard (counterclockwise) rotation or opposite rotation

NEW SERVICE EASE

- Fuel or lube filters serviced from either side
- Remove heads without disturbing manifolding
- Easily inspect or remove pistons, rods and bearings through large side ports
- Externally mounted oil pumps for easy inspection and maintenance

For complete specifications on the D398 and D379 Diesel Engines or Electric Sets, contact your Caterpillar Dealer or Caterpillar Engine Division, Peoria, Illinois.

CATERPILLAR

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Caterpillar Tractor Co., Engine Division, Peoria, Illinois, U. S. A.

IT'S WHAT'S UNDER THE HOOD* THAT COUNTS

Like the motor in your car or truck, what's under the hood of your **Kinnear Rolling Door** is as important a part of its extra value as the part that is always in view.

Concealed in the hood of each **Kinnear Rolling Door** is a mechanism so skillfully engineered and ruggedly built that it has no equal for long-lasting, low-cost efficiency.

In fact, the rugged precision of Kinnear's under-the-hood mechanism is one of the reasons it so seldom needs to be seen (just as you seldom look under the hood of a car with a trouble-free motor).

Although this sometimes makes the first cost of **Kinnear Rolling Doors** a little bit higher than "copies," *it also assures lowest-cost door operation and maintenance.*

Under-the-hood quality is also one of the reasons so many **Kinnear Rolling Doors** have served continuously — *often in daily use* — for more than half a century!

In addition, **Kinnear Rolling Doors** offer coiling upward action that clears the entire opening quickly . . . saves floor, wall and ceiling space . . . keeps the opened door curtain out of the reach of damage by wind or vehicles.

When fully closed, **Kinnear Rolling Doors** *provide extra protection* against wind, weather, vandalism, trespass—even against fire. (Heavy galvanizing** resists corrosion, and Kinnear Paint-Bond makes any finish coating you apply adhere immediately and last longer.)

Hot-dip galvanizing adds 1.25 ozs. **pure zinc to each sq. ft. of metal (ASTM standards).

The KINNEAR Mfg. Co.
FACTORIES:
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KINNEAR
ROLLING DOORS
Saving Ways in Doorways

tapped to furnish leadership for technical and other phases of a foreign aid program. The elder statesmen of our profession could do much to help make the peace corps a good-will army of capable technicians.

"Further, I'd like to suggest formation of a joint committee of our own professional societies to volunteer guidance and counsel to the Administration and Congress in the selection of the best methods of rendering technical assistance abroad. The committee, one similar to the Western Society of Engineers Civic Committee but broader in scope, could bring together a wide range of engineering wisdom and experience. It goes without saying that volunteering in this or any other public enterprise carries with it a responsibility to contribute to the fullest extent of one's capabilities.

"The international field is fertile ground into which professional engineering societies might well sink their plowshares, and with their skills open up new areas in which freedom and respect for human dignity will flourish." — William V. Kahler, on receiving the 1961 Washington Award from *The Western Society of Engineers.*

For Purchase Requisitions

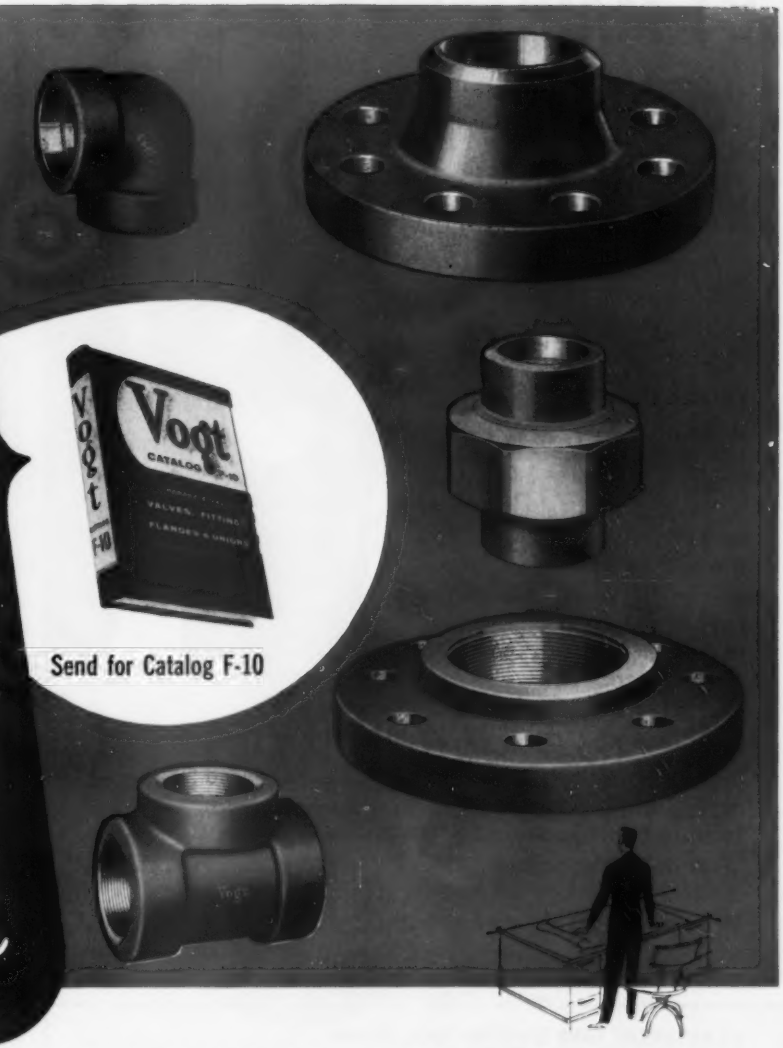
"As the result of wasteful inflationary malpractices, business has now turned into a depressed buyers' market. Unless the decline in prices is halted by economic measures, unemployment and stagnation will result. More public and semipublic works in open low bid competition will only aggravate the situation by reducing profits to losses, thereby creating more bankruptcies and depressions.

"The answer to bid-peddling, shopping, and cutthroat competition is the same as it was 40 years ago — the issuance of a uniform Purchase Requisition indicating the quality and quantity of material and labor required as an integral part of the bidding and contract

STRONGER and SAFER for every high pressure pipeline duty...

...because they are **drop forged** *by*

Vogt



Constantly imitated but never duplicated, Vogt forged steel fittings and flanges have unmatched strength and toughness for your most severe pipeline duties. Laboratory controlled materials and Vogt's special forging techniques assure products which are always uniform in structure, fine grained, and free from porosity. Thereby the shocks and stresses imposed by high pressures and high temperatures are easily withstood, and with stubborn resistance to erosion and corrosion. Consult Catalog F-10 for our complete line of fittings and flanges.

For a copy of Vogt Catalog F-10 address Dept. 24A-FCE.

HENRY VOGT MACHINE CO., P.O. BOX 1918, LOUISVILLE 1, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Los Angeles

OTHER VOGT PRODUCTS

Forged Steel Valves — Petroleum Refinery and Chemical Plant Equipment — Steam Generators — Heat Exchangers — Ice Making and Refrigerating Equipment.

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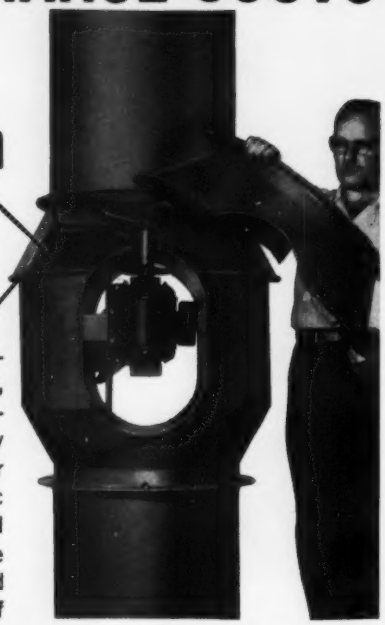
DROP FORGED STEEL

Fittings and Flanges

CUT MAINTENANCE COSTS

with this new design duct fan

Entire half of cone comes off . . . not just an access door . . . exclusive feature



While the DE BOTHEZAT® Bifurcator® **remains in the duct,** this new design duct fan provides an **easier, quicker** way to remove the fan wheel or motor . . . **speeds up** periodic inspections of fan wheel and extension shaft. The entire half of the cone unbolts and comes off, allowing plenty of room to work.

U.S. Patents 2,898,030 2,932,441

dependable . . . easy to install

Installation is as fast and simple as putting in a section of ductwork. DE BOTHEZAT direct drive motor, completely isolated from fumes and heat, insures steady, trouble-free operation over long periods. Ideal for handling corrosive fumes.

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Yes, I'm interested in cutting maintenance costs with DE BOTHEZAT Bifurcator Fans and the exclusive removable cone design. Please rush descriptive literature.

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Published ratings on DeBothezat Fans tell you exactly what the complete fan unit puts out. No guesswork — no allowance to be on safe side!

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documents. This would expose errors and reduce malpractices that are now destroying the profits and stability of industry.

"Purchase Requisitions would prevent risky and reckless bidding, thus stabilizing profits and business. It would also eliminate the needless expense of contractors and subcontractors preparing repetitious surveys, costing billions of dollars annually in wasted effort.

"It is within the power of architects, engineers, and contractors to change conditions by demanding Purchase Requisitions on public and private projects, as the basis of bids and contracts, for the protection of buyer and seller, and thereby prevent depression and open warfare now in the making." — *Construction Surveyors Institute.*

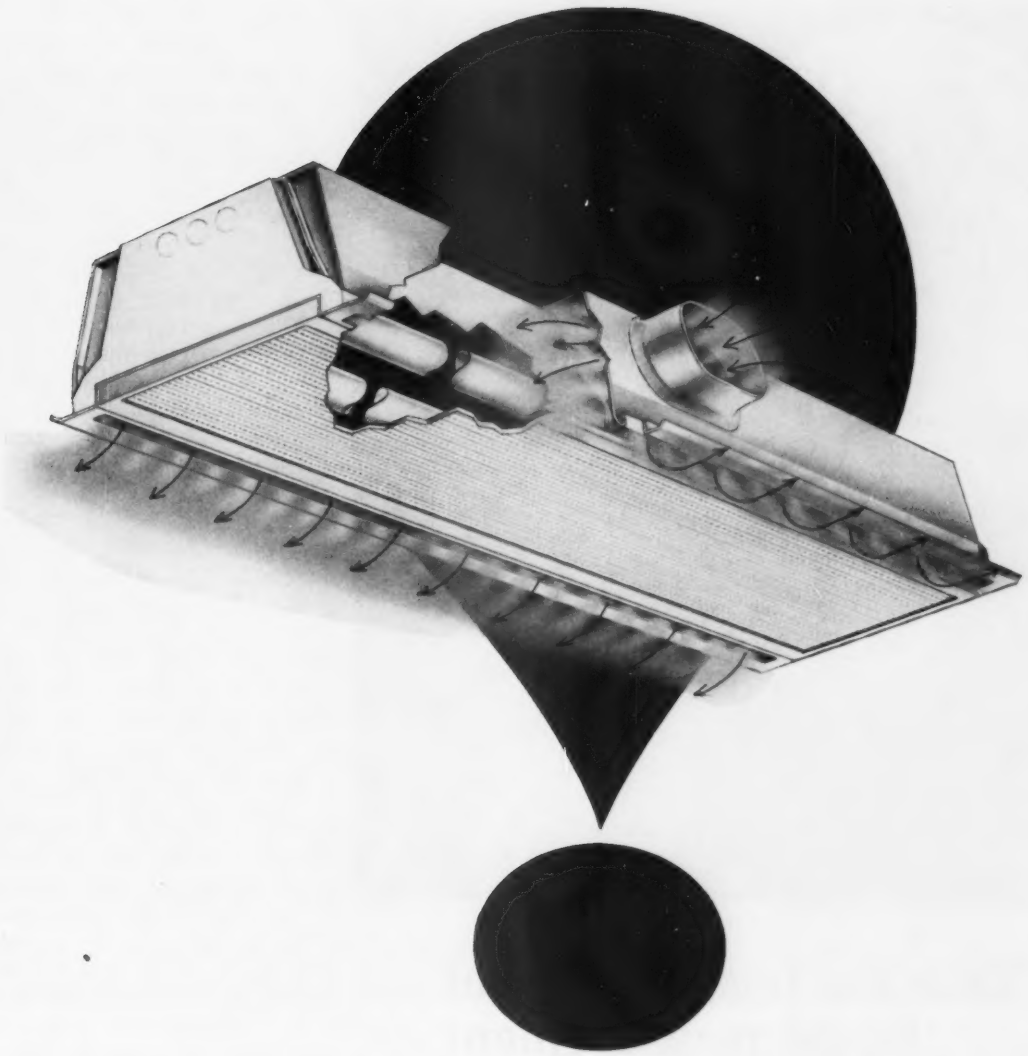
Britain's Engineers Unite

"Unification of the engineering profession has been taken a step further. In their recent postal referendums, members of the Institution of Civil Engineers and the Institution of Municipal Engineers voted overwhelmingly for amalgamation. Of the 7690 civil engineers who voted, 5757 were in favor; of the 5015 municipal engineers, 3108 approved." — *Economist,* March 1961.

A Sound Highway Program

"So, in summing up, I think that we have a sound highway program well under way. And I expect, if we put forth the required effort, to obtain understanding of all our folks, that we will be able to keep it on schedule. I believe we all recognize that we must meet our needs in this rapidly changing, challenging world of today, and one of our prime needs is an adequate highway system. Meeting this need requires broad perspective, imaginative and creative thinking, open mindedness, and a questioning attitude . . .

"Actually, I believe our highway program has proven to be a catalyst that has sparked and is bringing about careful community planning



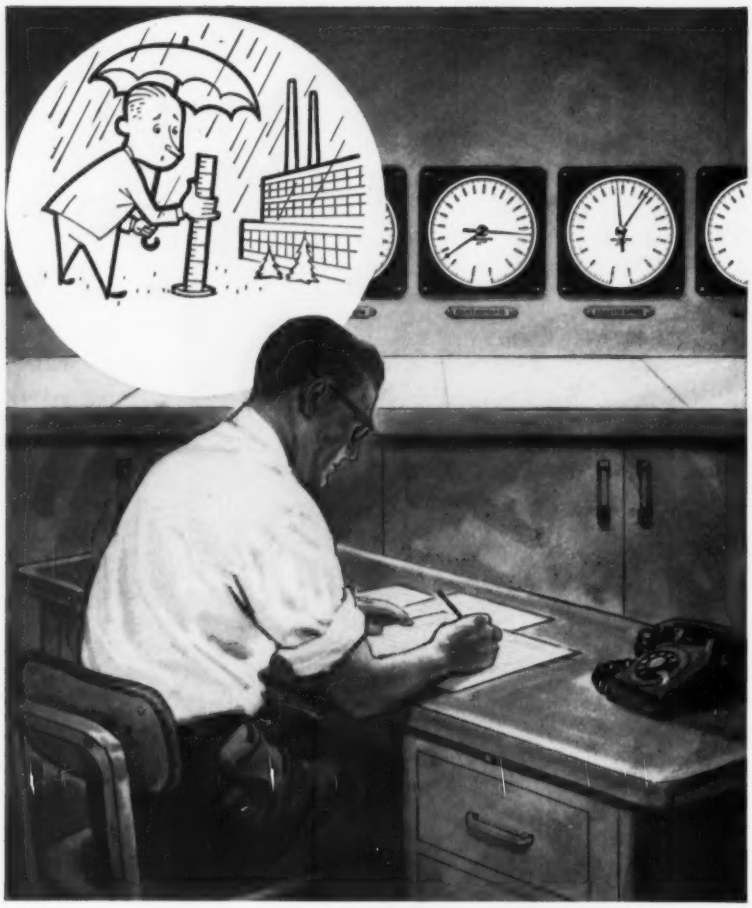
The fixture that leads 4 lives...

VENTRO-LUX

it provides light • heat • cooling • ventilation

As part of a 10 year product development plan, Curtis AllBrite presents a new fixture, the Ventro-Lux with Anemostat air-diffuser. Four essential services are provided in this combined unit—excellent diffusion of light plus the optimum in heating, cooling and ventilation. The exclusive CALux lens provides effective concealment of lamps, high light output plus attractive appearance. The separate Anemostat air-diffuser handles a high capacity of air which it diffuses horizontally along the ceiling. Result—draft-free distribution, no hot or cold spots, no ceiling smudge. The Ventro-Lux is the first troffer to be combined with a high capacity air-diffuser. Since the Ventro-Lux and Anemostat units are installed separately there is no conflict in the trades. Curtis AllBrite Lighting, Inc., 6135 W. 65th St., Chicago 38, Ill.—352 Shaw Road, South San Francisco, Calif.—Toronto, Canada—Vancouver, B. C., Canada.

CURTIS-ALLBRITE
LIGHTING, INC.
Visioneers in Planned Lighting



Take the legwork out of liquid measurement

Here's practical liquid measuring—the modern way... without roaming all over the lot! Liquidometer Gauges let you inventory distantly stored liquids at a glance.

Completely automatic Liquidometer Gauges can be located as far as 250 feet from tanks. Think what this centralized system can mean in man-hours saved—let alone the additional safety of personnel who no longer have to trudge to, or tamper with, hard-to-get-at tanks.

Simple to install, and requiring no maintenance, Liquidometer Gauges measure virtually all liquids conveniently, continuously, and correctly. There's a type available for practically every liquid measuring application.

For complete details, write

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THE LIQUIDOMETER CORP.

Dept. C , LONG ISLAND CITY 1, NEW YORK

to cover the whole wide range of the ramifications of the problems of our present day urban society. We are realistically facing up to our problems and cooperatively setting out to resolve them." – Ellis L. Armstrong, president, *Better Highways Information Foundation.*

Where the Architect is Going?

"It is no longer enough for us to bend over our drawing boards and draw pretty elevations and play with shadows. We must learn to understand not only the laws of esthetics and technical engineering, but the human laws of politics, sociology, psychology, and economics.

"There are, of course, experts in all these fields. There are the social planners and economists and the men and women who devote long years to the study of the behavioral sciences. None of us will ever be able to match the knowledge of each one of these experts in his field. Nor is life long enough to engage in the accumulative years of training necessary in these areas.

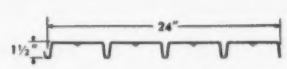
"To coordinate the sociological aspect of design with the engineering aspect does not require us to be either learned sociologists or skilled engineers. But it does require the ability to understand the language of these experts, to bring them together, and to direct them towards the highest possible common purpose.

"For these experts alone, in each of their specialties, can never have the comprehensive view to ring all these needed areas of knowledge together into one satisfying over-all solution and design.

"Design is the word. A human environment can never be achieved by only engineering, or only sociology, or only traffic management. It requires comprehensive, three-dimensional, and conceptual planning – total design.

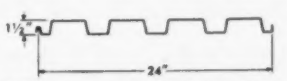
"Design, essentially, means coordination. As I see it, this coordination should be done by the architect." – Philip Will, Jr., in *The AIA Journal*, January 1961. ▲▲

When it comes to roof systems, INLAND covers everything!



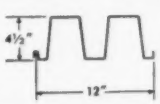
A-DECK — For purlin spacings not exceeding 8'4". Narrow ribs provide deck surface that supports the thinnest or softest type of insulation.

H-DECK — New! For simple spans from 10'0" to 20'0" — 3 and 4½" depths. Especially practical to cover walkways in shopping centers, schools, other installations.



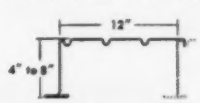
B-DECK — For spans to 10'0". Wide rib distributes metal for greater structural efficiency — gives higher section properties per pound of steel — well suited for use as side wall panels.

B-ACOUSTIDECK — Two-in-one panel combines steel roof deck with acoustical ceiling having Noise-Reduction Coefficient of .70 — used for spans to 10'0".



C-DECK—Carries normal roof loads over spans up to 24'0". Used extensively in canopies.

C-ACOUSTIDECK — Offers same Noise-Reduction Coefficient as B-Acoustideck. Can be used for spans to 24'0".



T-STEEL — New! Galvanized only — for clear spans to 32'0". Adaptable to acoustical and flush, luminous ceiling treatments. Provides superior diaphragm to transmit seismic and wind loads.

RIBFORM — High tensile galvanized steel form for concrete slabs over spans up to 8'0". Three types: Standard, Heavy-Duty, Super-Duty.

Whether your design calls for a dry insulation board roof or for wet-fill, there's an Inland roof system for the job — by the makers of famous Milcor steel building products.

Inland steel deck weighs less than half as much as poured-in-place or pre-cast construction. You can space joists wider and use lighter framework, to save both time and money. Panels are easy to handle and weld in place — in any weather that a man can work.

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Write for catalog 248 — or see Sweet's section 2i/Inl.

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ENGINEERED PRODUCTS DIVISION

INLAND STEEL PRODUCTS COMPANY

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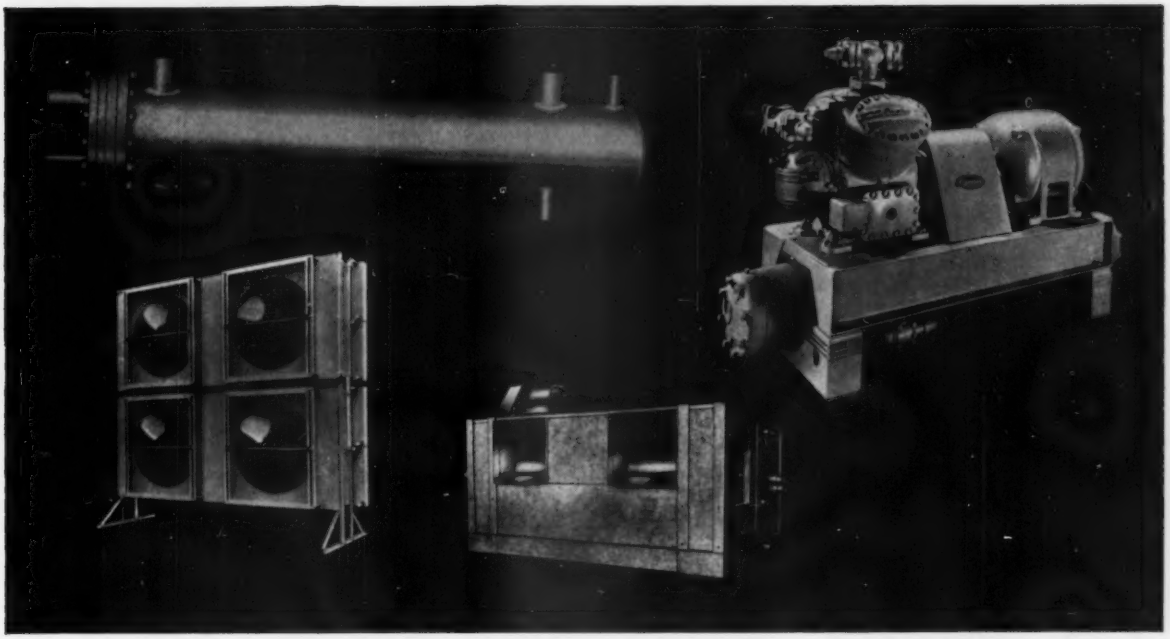
WHICH HEAT PUMP SYSTEM IS BEST FOR YOUR REQUIREMENTS?

Air to air, air to water, water to air or water to water ...Carrier has all the components to meet the exact needs of any commercial, industrial or institutional application!

Which is the best system for your requirements? That depends on the heat source, air or water, and method selected for inside distribution.

Because it is available everywhere in unlimited amounts, outside air is the most popular source of heat. When other sources are unpredictable, an air source system is usually best. It's usually best, too, when a building or factory has exhaust air which can be used advantageously. Conversely, if water from well, surface or process is available, at a proper temperature, then a water source system is indicated.

Inside considerations: If the inside system employs direct expansion units for air treating such as shopping centers, stores, schools, churches, etc., then the type of heat pump system indicated is air to air or water to air. On the other hand, the inside system may use water as the cooling and heating fluid to various air treating assemblies such as under-window fan coil units. In those cases, particularly in multi-room

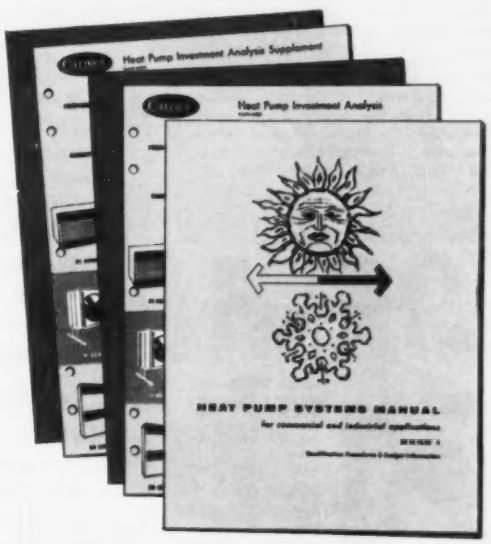


For big jobs – the largest office building, factory, department store, church or apartment house – there's a complete line of Carrier Weathermaker Heat Pump components: compressors, water chilling machines, air cooled condensers, central air handling units, zoning air handling units and room units.

applications such as offices, hotels, motels, etc. . . . depending on the heat source . . . the preferable system is air to water or water to water.

Carrier offers all the components necessary for any type of system. Carrier has also developed a wide background of practical information which can be helpful in the selection and design of a system. "Weathermaker* Heat Pump" information is available on request. Write Carrier Air Conditioning Company, Syracuse 1, New York.

*Reg. U. S. Pat. Off.



Yours on request – this "Weathermaker Heat Pump" information includes system design information, equipment and performance data, typical design problems, cost comparisons between systems, investment analysis and many other subjects pertinent to the selection and design of a system.

Carrier Air Conditioning Company

EST. 1856
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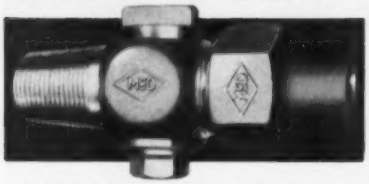

CORPORATION STOPS. With straight coupling nut. INLET: AWWA thread. OUTLET: Standard AWWA thread for copper service pipe. Sizes ½" thru 2".

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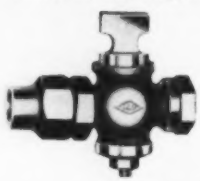
Specify McDONALD

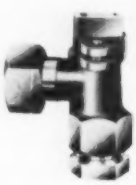
You can rely on good workmanship and good quality brass when you specify McDonald.

Here's the reason why: McDonald's have a 105-year old reputation for reliability. McDonald Brass Goods are made only of the best available materials.

McDonald's pride themselves on their high standards for constant quality control. Only the best in brass goods ever leaves the McDonald plant to fill your order. — CONTACT McDONALD FOR YOUR BRASS GOODS REQUIREMENTS.



CURB STOPS. Designed for dependability with threads according AWWA specifications.



ANGLE METER STOPS. Plain or lock wing style. Sizes 3/4" & 1".

EXTENSION SERVICE BOXES. Complete with stationary rod for curb stops 1½" to 1" inclusive. (Send for Catalog sheet listing other models.)

Write for complete details and specifications.

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BRASS GOODS ● PUMPS
OIL EQUIPMENT ● DRAINS

Canadian Consulting Engineers Urge Government Cooperation

THE ASSOCIATION of Consulting Engineers of Canada has presented a brief to the Royal Commission on Government Organization (a counterpart to the United States' Hoover Commissions) explaining why the Canadian government should use consulting engineers, and not build its own engineering empire. The brief recommends that government bureaus cease expanding their engineering departments; that a definite Federal policy on the use of consulting engineers on government projects be instituted; and that a Canadian Planning Board be formed. This Board, reporting directly to the Privy Council, would be organized for the following purposes:

¶ "To plan, in general, the expansion of fixed capital assets of the nation in accordance with current government policies, and to execute that planning in a manner to meet departmental requirements but meanwhile ensuring coordination of effort in all areas.

¶ "To maintain continuous information on the total progress of work and expenditures for all projects and all departments and to control and/or direct the rate of execution and expenditure.

¶ "To ensure implementation of established policy with respect to the functioning, size, and nature of engineering staffs in all departments, and to ensure uniformity of procedures, a minimum of duplication, and a minimum of idle staff through temporary inter-departmental transfers to meet peak work load demands.

¶ "To apportion the work among the departments."

Stressing that the entire brief was offered as constructive suggestions — not as criticism of any specific government departments or individuals — the Canadians point out that "Our Association is greatly concerned with a trend which is taking place in certain departments and agencies of the Federal government in employing increasing numbers of professional engineers and technicians to enable them to provide complete engineering services in connection with their work projects. These are services provided normally by independent firms of consulting engineers.

"It is fully recognized that certain departments and agencies of the Federal government require professional engineers and technicians on their staffs to perform a number of very important functions as follows:

¶ To assess and determine departmental requirements.

¶ To plan future developments.

¶ To prepare budgets.

¶ To establish standards.

¶ To provide for maintenance of property, buildings, and equipment.

¶ To give technical advice to deputy ministers or department heads.

¶ To negotiate with independent firms of consulting engineers for the planning, design, and supervision of various governmental assignments and work projects.

¶ To anticipate departmental requirements and to see that such are provided.

"It is contended, however, that design and supervision are functions of the independent consulting engineering firms and can be carried out by them more economically and expeditiously than by engineers in government employ."

Most of the reasons given for using consulting engineers (instead

UNEQUALLED FOR FEATURES AND PERFORMANCE

DRAW-OUT DESIGN LIMITAMP* CONTROL

CONTACTOR IN PLACE

. . . speeds Limitamp control inspection and maintenance

Maintenance is an easy job with General Electric's draw-out Limitamp control. Routine maintenance is quickly performed with the contactor in place.

Coils and contact tips can be changed in minutes. Simply lift out the arc chutes and one arc horn to expose the bolts holding coils and tips in place.

To make your job still easier, a magnet-head wrench is supplied with units. This wrench fits all bolts necessary to change coils and tips. Remember . . . Limitamp control is all front connected.

To replace fuses, you just pull the ejector and the fuses pop up. When a fuse is replaced, it is guided into position by a back-stop on the clip.

Another feature is a special test circuit—built into each control. Bring in external power and connect it to the terminal board. You can then safely operate the panel—automatically isolated from normal power source with the door open—to check out the unit before putting it in service.

Ask your G-E Sales Engineer or Agent about other advanced-design maintenance, installation, operation, and performance features of Limitamp control. Or, write Section 783-25, General Electric Co., Schenectady, N. Y. for Bulletin GEA-6893. Industry Control Dept., Salem, Va.

* Reg. Trade-mark of General Electric Company.

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35 AMP

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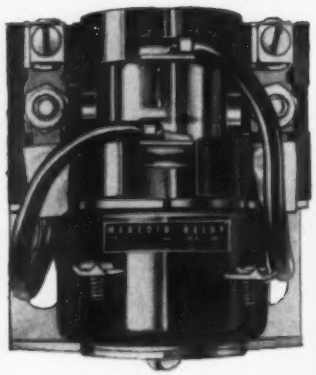
MERCURY RELAY



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WRITE FOR BULLETIN 0-20

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

of expanding government departments) will be familiar to United States engineers, who have wrestled with a similar situation. However, the Canadians have one additional argument: if Canadian consultants cannot get work in Canada, their employees will get jobs in the U. S., with a resulting loss of talent in Canada.

The summary of points in favor of using consultants stated:

"If government departments, commissions, or agencies acquire sufficient numbers of professional engineers and technicians to provide complete engineering services during peak load periods, there will be little or nothing for these people to do when slack periods occur. There is considerable reticence on the part of any civil service to discharge employees, and therefore the increasing burden is placed on the public treasury for which no value is received. Consulting engineers are employed only when their services are required for specific projects.

"The majority of large engineering projects today require the services of a number of experienced specialists. The independent firm is able to seek its talent anywhere and without restriction.

"The majority of large projects originating from government sources require a very considerable amount of negotiation with municipalities, railways, public utilities, and private owners. The independent consultant is not hampered by regulations concerning channels of communication between government departments and outside sources. It follows, therefore, that as a rule, work goes out to tender in a much shorter time.

"It is extremely difficult — in fact, almost impossible — to determine accurately the cost of engineering services on any specific project, when such services are provided by government engineers. On the other hand, the engineering cost of each project is readily and accurately established when the services are furnished by independent firms of consulting engineers.

"The independent consulting firm is responsible for its work and for any errors in design or laxity in carrying out supervision. On the other hand, the Government of Canada accepts responsibility for engineering services provided by its servants."

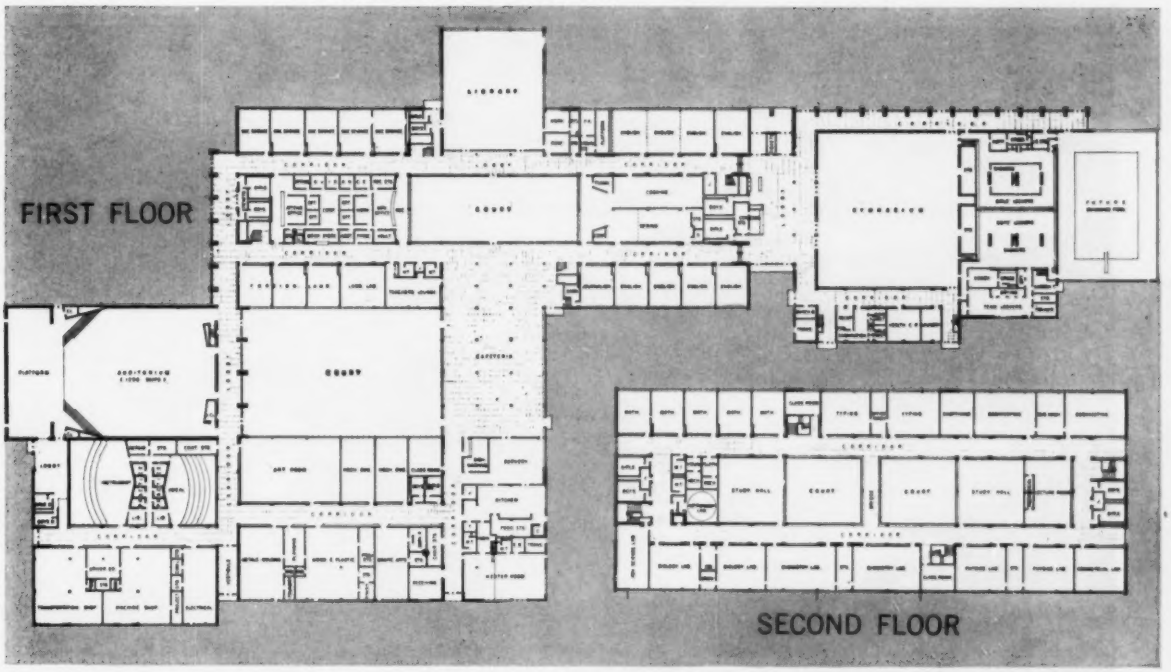
Although not given as the official reasons for using consultants, the brief continues by pointing out the problems of the consultant:

"In recent years, Canadian consulting firms have secured work in foreign countries, which has resulted in an increased export of Canadian materials and equipment.

"The consulting engineer's work comes from many sources, but a very large percentage comes from Federal government projects. Projects arising from this source are usually of considerable magnitude, and are therefore a most important part of the consultant's work.

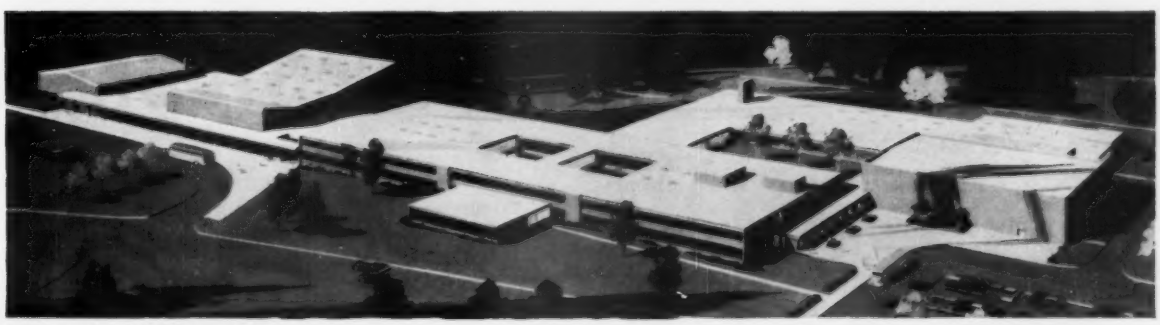
"If Federal government departments and agencies continue to increase their engineering staffs in order to provide complete service for their projects, the consulting engineers will be obliged to reduce their staffs considerably. A number of firms might well be forced out of business, and many professional engineers and experienced technicians undoubtedly would seek employment in the United States . . . such a situation would constitute a serious loss, the effect of which would be felt in localities from coast to coast.

"If our Canadian consulting engineers were deprived of government works of magnitude, the resulting lack of experience on large works would tend to force them into a minor status. Big business, in all probability, then would revert to a former custom of employing consultants from the United States or elsewhere. Such reduction in status also would minimize the possibility of Canadian consulting engineers being retained for work in foreign countries." ▲▲



AT PARMA...the size and scope of the new Valley Forge High School put special emphasis on the need for an efficient Time Control and Program system, free of operational and maintenance problems. This lead to the selection of Stromberg timing. Dependably correct clocks and signals are assured by the precision Master Time Control. This modern time system operates from ordinary lighting circuits. Complete uniformity of time is maintained by supervisory pulses each hour and every 12 hours over a control circuit. Stromberg maintains installation and maintenance service throughout the U.S.A.

A complete catalog — TIME AND SIGNAL EQUIPMENT — prepared for Architects and Engineers — is yours for the asking.



PLANNING THE NEW SCHOOL

A population explosion at Parma, Ohio completely overtaxed secondary school facilities. Rather than expand the old school, construction of the new Valley Forge High School was started in May of 1960 and scheduled for completion in advance of the school year beginning September 1961 at a completed cost of $4,000,000. The new structures — containing 70 classrooms, adequate library, science, language, shop and music facilities, as well as an ample auditorium, cafeteria and gymnasium — is planned to accommodate 2,000 students. Despite these impressive new facilities, plans are now being made for a third secondary school.

The Parma Public Schools, Mr. Paul W. Briggs, Superintendent — were advised in their choice and installation of Time Controls by:

Fulton, Dela Motte, Larson, Nassau & Associates—Architects
Mr. Vincent A. Lombardi — Electrical Engineer
The Doan Electric Company — Electrical Contractor

STROMBERG DIVISION

GENERAL TIME CORPORATION
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MAKERS OF THE WORLD'S FINEST TIME EQUIPMENT

All five units in this stockpiling-reclaiming Barber-Greene belt conveyor system are shown here . . . the unloading conveyor . . . cantilevered radial stacker . . . two reclaiming conveyors . . . and the enclosed conveyor atop bunkers that fills bunkers automatically.

At new Steam Plant in Sarnia, Ontario:

AUTOMATED BARBER-GREENE STOCKPILE

One man controls Canada's highest-capacity steam plant coal handling system

Dow Chemical of Canada, Limited specified and got a stockpiling-reclaiming belt conveyor system as ultra modern as the rest of its new steam plant at Sarnia, Ontario.

Working as a team, Dow Chemical and Barber-Greene engineers designed an automated conveyer system that can stockpile 20,000 tons of coal in eight hours at 2,500 tph. The bunkering conveyor system reclaims, crushes, samples and weighs coal before delivering it to steam plant bunkers at 440 tph.

Self-unloading ships deliver coal to a special dock on St. Clair River and feed it at high speed into a 20′ x 20′ hopper. The hopper feeds a 60″ x 325′ belt conveyor that moves coal at 670 fpm to a cantilevered radial stacker. This special 110′ stacker with 60″ belt stockpiles in a 150° arc.

Material is reclaimed on a 170′ tunnel conveyor under the pile that feeds the crusher. Tramp iron is removed by a magnetic head pulley on the conveyor, and the coal is discharged into the crusher. A 319′ conveyor fed by the crusher moves the coal over an automatic weighing device to a 115′ tripper conveyor that automatically charges the bunkers.

Get the same very special attention for your bulk materials handling problems, no matter how complex or commonplace, by calling in your Barber-Greene Conveyor Representative.

Your belt conveyor equipment headquarters.

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CONVEYORS • LOADERS • DITCHERS

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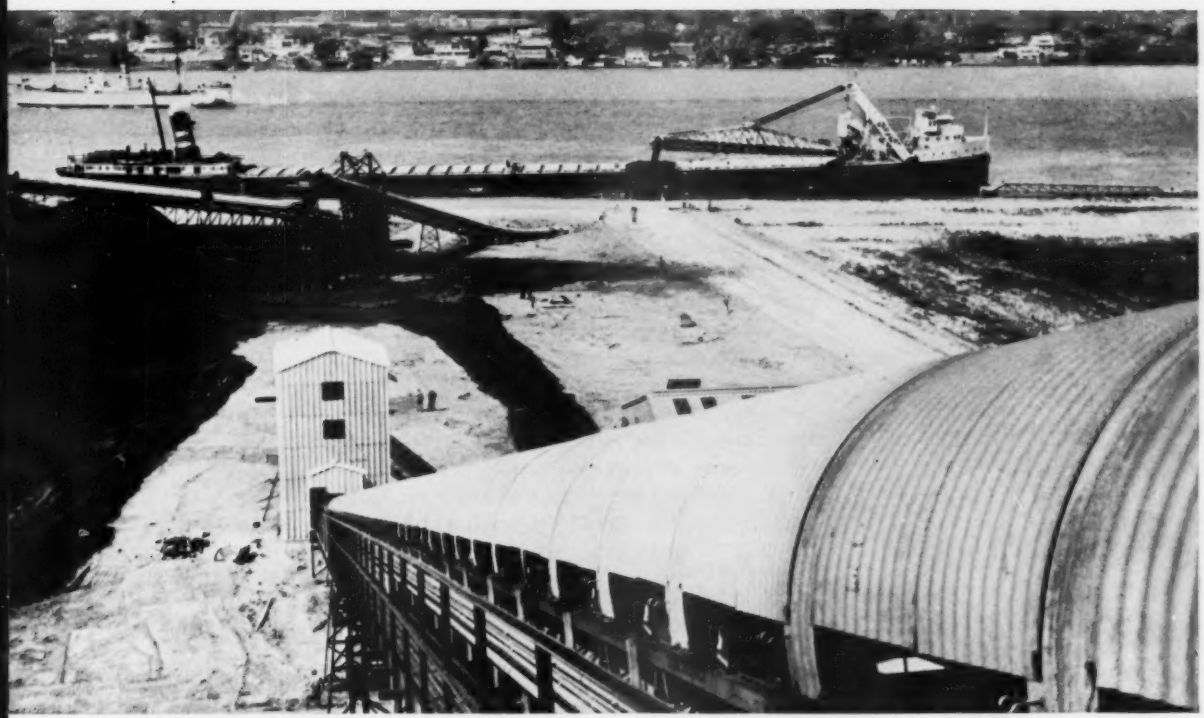
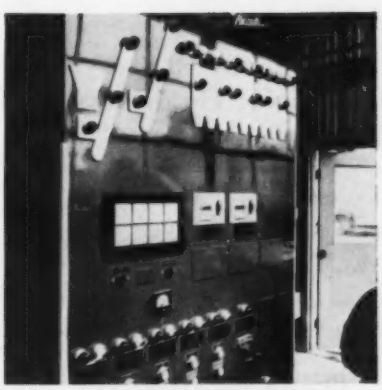


Huge coal ship spends minimum time at river bank dock because high-speed Barber-Greene stockpiling conveyors can transfer 20,000 tons of coal to stockpile in eight hours. Utilization of many control devices makes system both automatic and safe to operate.

BELT CONVEYORS COAL AT 2,500 T.P.H.

Specially-designed counterweighted radial stacker is supported only at tail end. By means of level indicator and timer, it automatically moves to new position each time coal reaches head of stacker. Both stacker and conveyor feeding it can be stopped from any point by operator. Conveyor system's 800-1,200 hour lube interval minimizes maintenance needs.



Entire operation is automatically controlled from two master control panels. Panel lights indicate operating status of all equipment in system.

The Readers' Guide

Specifying Acceptance Tests
page 94

"The research and cataloging required for proper specification of factory acceptance tests is quite a problem. There are other problems . . . one is the possibility of piggy-backing into a specification a whole series of tests that were not meant to be included." W. A. Tripp points out the pitfalls of assuming that acceptance tests can be covered adequately by a brief reference to the standards.

Rent, Build, or Buy?
page 110

"Thus, the majority of consulting engineers continue to rent rather than own their office and drafting space, although a growing number of firms has found it desirable to build." West Coast Editor Ralph Torgerson points out the pros and cons of renting and owning office space, referring to the solutions found by several consultants.

Dust and Fume Collection
page 118

"It often has been said that the best way of solving an air pollution control problem is to reduce or eliminate it at its source." This, according to Carl Flodin, can best be done by careful design and specification of dust and fume collection systems.

Growth of the Profession
page 130

"Perhaps consultants could grow if more executive-type engineers entered the consulting field." A staff report finds that consultants have widely disparate opinions on the growth of the profession.

Engineers in Public Life
page 116

"It is as a profession – a group – that engineers can make the greatest impact on the public." T. Carr Forrest considers the importance of an engineer's role in the public affairs of his community.

Determining Flood Peaks
page 107

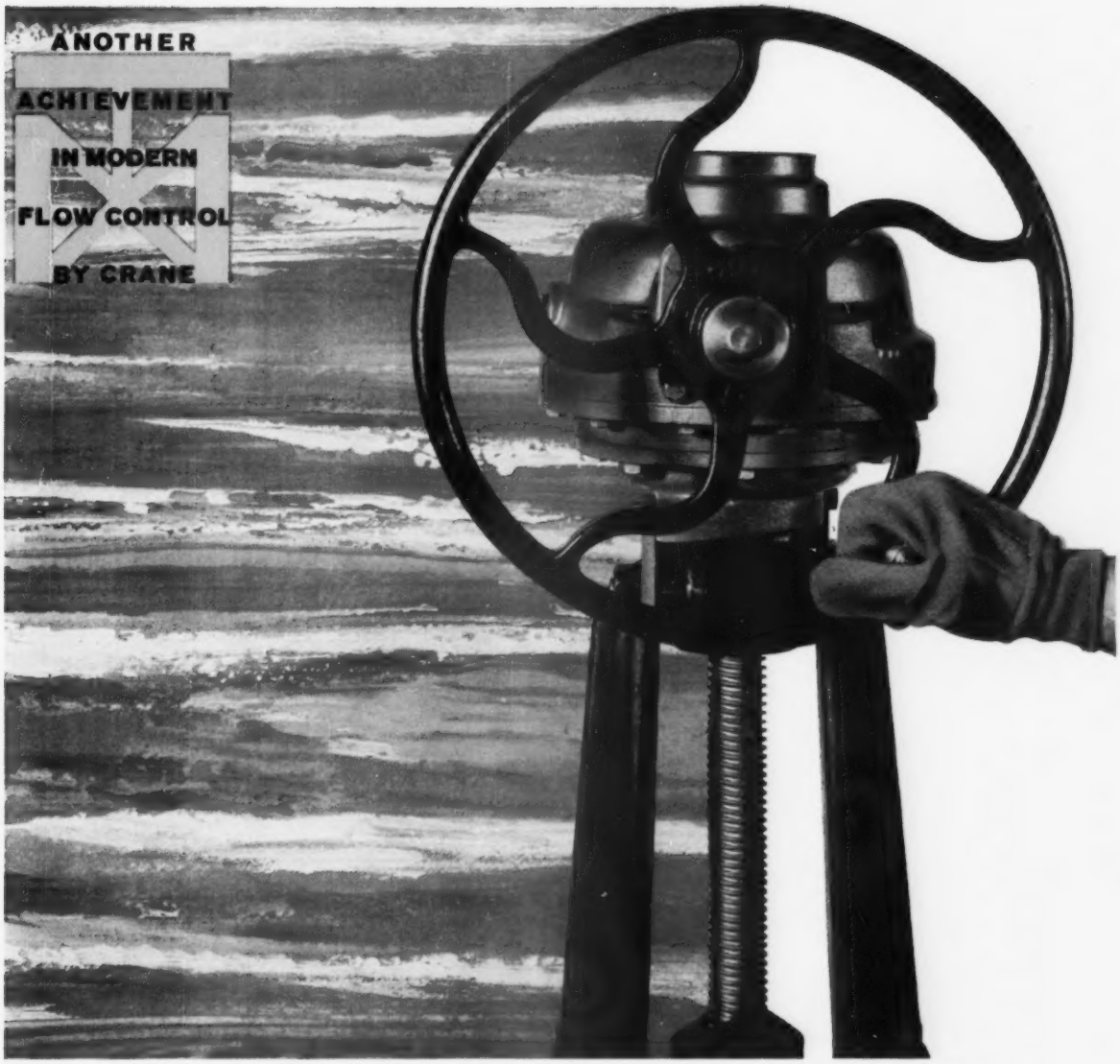
"One must resort to a frequency analysis of peak flows to determine the recurrence intervals for floods of various magnitudes." Professor Joseph Franzini presents a method for determining peak flood flows in regions where extended records are not available.

. As Others See Us
page 134

"Strange as it may seem, I always liked an engineer who could look you in the eye without fiddling with his [slide rule.]" Architect Robert Jacobs deflates a few puffed-up professional notions.

Belidor on Hydraulics
page 126

"I have thought it wise to . . . correct many essential details, founded on some principles of hydraulics, previously stated, of which I have perceived the error." French engineer-author Bernard Belidor is revived an dreviewed by James Kip Finch.



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CRANE'S NEW CONVERTO-GEAR OPERATOR

gives you torque enough to tame a torrent. In a matter of minutes, you can power up a wide range of Crane iron and steel gate valves: OS&Y's with ball-bearing or split yokes, rising and non-rising stem types with stems up to 2½-inch diameter.

Take your choice of two styles—horizontal or vertical wheel—both with spiral-cut bevel gears of carburized alloy steel yielding a 4.11 to 1 ratio in manual operation, or with portable air or electric power. Mechanical efficiency is over 95%, with three sets of ball bearings to cut friction, and the entire self-lubricating unit is rugged and weatherproof.

The kit is complete, for simple installation in less than 30 minutes—or your Crane Distributor can take your order now for new valves already fitted with the power-packed Converto-Gear Operator.

For complete details contact your Crane Distributor or write Crane Co., Industrial Products Group, 4100 S. Kedzie Ave., Chicago 32, Ill. In Canada, Crane, Ltd., 1700 Beaver Hall Square, Montreal.

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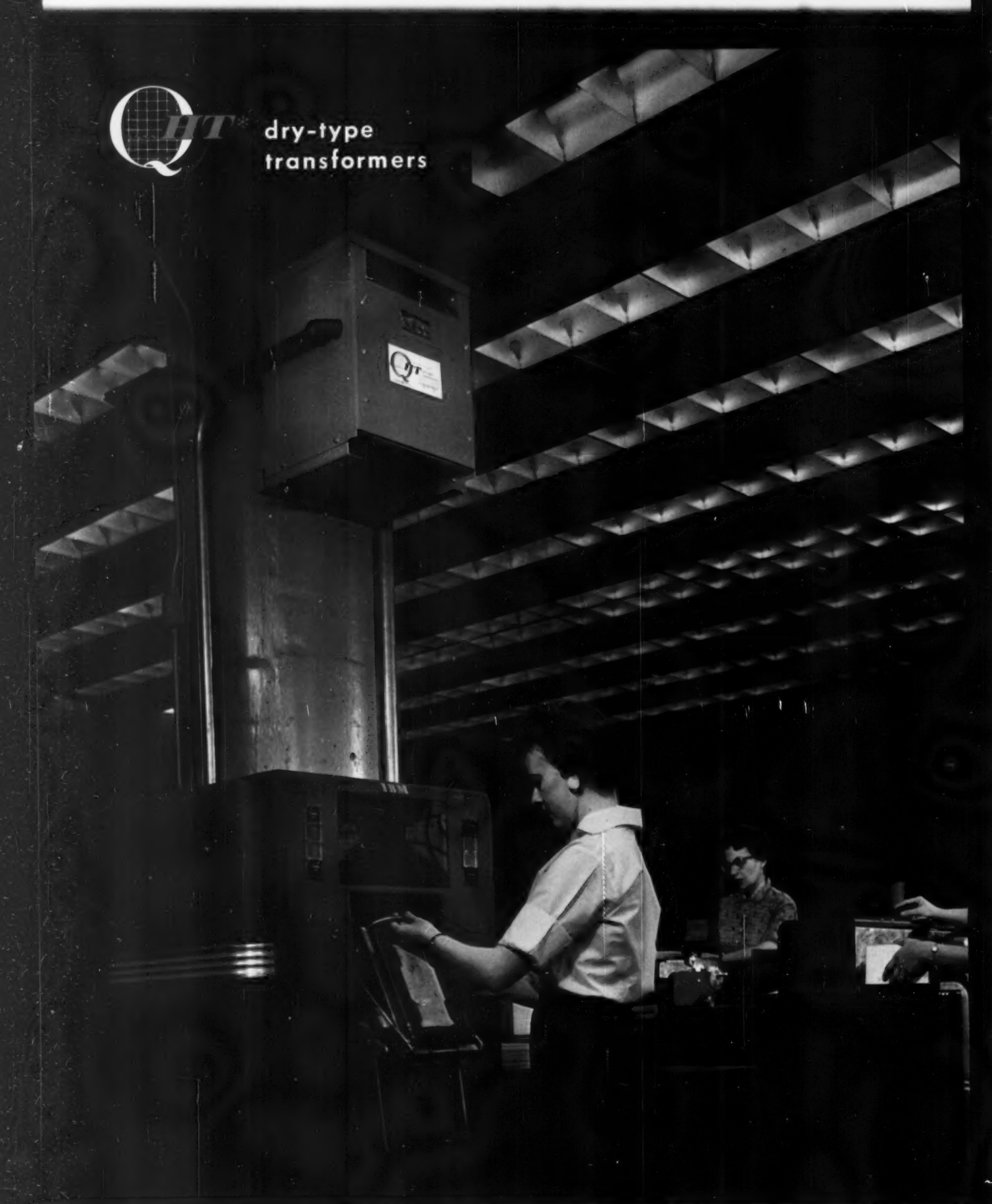
QHT* dry-type transformers



Wall-mounting of this compact QHT transformer provides bonus floor space for equipment and personnel.

Lighter, smaller General Electric QHT transformers give bonus floor space

The new General Electric QHT dry-type transformers save you production space because they offer savings up to 50 percent in weight and 67 percent in size compared with competitive dry-types. QHT units up to 75 kva have built-in provisions for wall mounting, and larger units can be set in out-of-the-way places near the load, saving the cost of long, low-voltage feeders.

A new insulation system permits use of smaller coils to reduce size and weight of QHT transformers. Inorganic silicone impregnated insulation is highly resistant to water, dust, and corrosive atmospheres. Also, aluminum conductors and cold-rolled, grain-oriented silicone steel combine to give you a smaller, lighter, quiet transformer designed for years of dependable service.

QHT dry-type transformers are easy to install. Units have conveniently placed, dual-sized knock-outs, large terminal compartments and wiring spaces. All wiring can be done from the front.

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45 KVA				
Height (in.)	26¼	41¼	30	32
Width (in.)	24	28⅝	31	22
Depth (in.)	19	26	19	28½
Weight (lbs)	430	780	790	500
Volume (cu. in.)	11,970	30,695	17,670	20,064
225 KVA				
Height (in.)	44¼	60	50	66¾
Width (in.)	41	54	56	55
Depth (in.)	24¾	30	28	37
Weight (lbs)	1500	2300	3000	2500
Volume (cu. in.)	44,902	97,200	78,400	135,836

† Transformers "A," "B," and "C" represent products of well-known transformer manufacturers. Data was taken from current published information.

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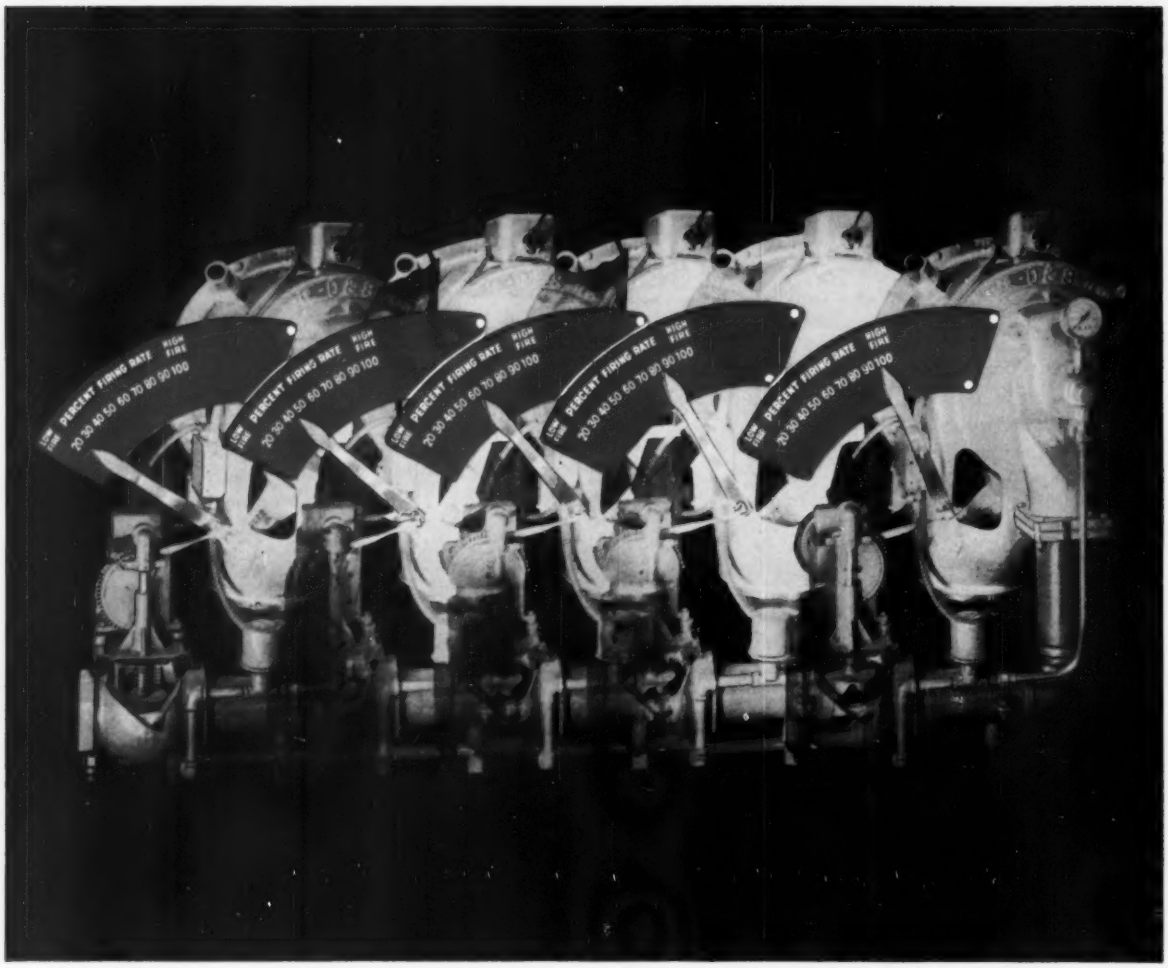

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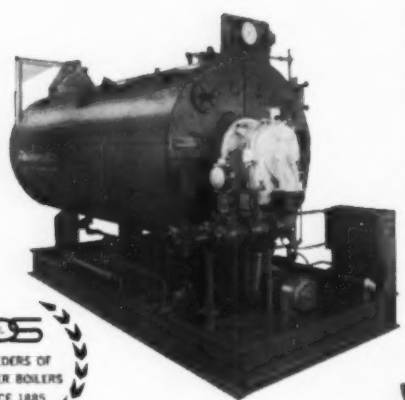

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Our Authors

T. Carr Forrest has been in private practice in his native Texas since 1921. His professional activity has included serving as a director, vice president, and president of NSPE. Forrest also takes part in community affairs, as a member of the Dallas Chamber of Commerce and the Dallas Master Plan Committee. He also is on the Board of Development of Southern Methodist University, and a trustee of the Southwestern Engineering Foundation. His article on the engineer in public life is on page 116.

W. A. Tripp, chief electrical engineer for the J. G. White Engineering Corporation, already has written several articles for CONSULTING ENGINEER. A graduate of the Massachusetts Institute of Technology, Tripp has worked in consulting offices since 1922. He is a life member of the American Institute of Electrical Engineers, a member of the American Physical Society, and is registered in New York and Massachusetts. His article on the specification of acceptance tests is on page 94.

Robert Allen Jacobs is, unquestionably and unrelentingly, a New Yorker. He was born in New York City; he graduated from the College of Architecture of Columbia University; his firm of Kahn and Jacobs maintains offices at Two Park Avenue. A fellow of the AIA and member of more than half a dozen important societies and associations in New York, Jacobs bears out a point we have long suspected — not only are architects people, they also have a sense of humor. For proof, turn to page 134.

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Carl R. Flodin, a graduate of the University of Washington, has worked on dust and fume collection and the application of air pollution control equipment for almost 20 years. He worked for various industrial organizations until five years ago, when he opened his own office. Flodin is a member of AIEE and the Air Pollution Control Association, and is registered in New York and California. His article on the specification of dust and fume collection equipment is on page 118.

Joseph B. Franzini, a native of New Mexico, received his Bachelors and Masters degrees in civil engineering from the California Institute of Technology. He received his doctorate in civil engineering from Stanford University in 1950. Professor Franzini, now associate professor of civil engineering at Stanford, is registered in California. He serves as consultant for hydraulic and hydrologic problems, and has written a text on hydraulic engineering. His article on flood control is on page 107. ▲▲

YARWAY Y news briefs

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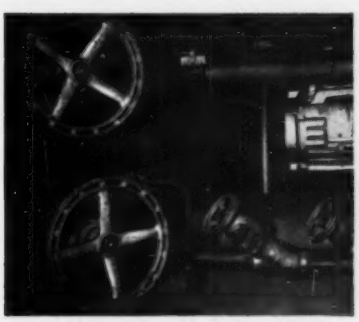
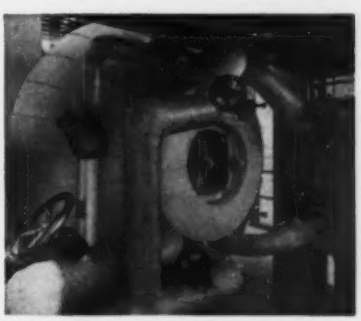


Four of many Yarway Welbonds installed in large eastern public utility plant. Steam pressure 1850 psi; temperature 1000°F.

Four Yarway Welbonds on main steam line to turbine at southern power plant. Press. 2310 psi; temp. 1000°F. Over 100 Welbonds here.



Six of 900 Yarway Welbonds at southwest utility. Boiler drum pressure in this plant—2150 psi; superheat temperature 1005°F.

W. A. TRIPP, Chief Electrical Engineer
The J. G. White Engineering Corporation

Product Acceptance Tests

CE exclusive

ONE OF THE IMPORTANT parts of any purchase transaction is the performance of tests by the supplier to demonstrate the soundness and acceptability of his product. Proper coverage of this requirement in the specifications is often far from the simple process it appears to be. For instance, for equipment regularly purchased, simple reference to applicable industry standards would seem to be sufficient. Unfortunately, it is here that the specification writer is confronted with his first set of complications.

In the first place, there is a multiplicity of standards — some tailored to the interests of the user and some to the interests of the manufacturer. Under the aegis of the American Standards Association, there has been a growing concordance, and even a unification, of these standards. But the process is far from complete. The subject of tests is treated very differently in standards applying to different kinds of equipment and materials. Thus, the engineer must be familiar with many different standards and must be able to adapt his handling of the subject to a wide variety of treatments. If his work is international in scope, the situation becomes even more complicated.

The general concepts of acceptance testing apply to equipment and materials of all kinds. However, the specific cases and examples that follow are drawn from the area of the writer's primary interest — the use of electricity in power and industrial applications. References are primarily to those standards, applying to electrical items, which are in force in the U. S. The main sources are:

¶ ASA — American Standards Association.
¶ AIEE — American Institute of Electrical Engineers.
¶ NEMA — National Electrical Manufacturers Assn.
¶ IPCEA — Insulated Power Cable Engineers Assn.

The consulting engineer's first problem is to determine what tests can be justified for a particular project. This may vary for the same equipment from project to project. The minimum, in any case, includes the tests a manufacturer expects to make without addition to the price. Frequently, these will be approximately the same as the group of tests variously identified in the standards as production tests or routine tests.

Some production or routine tests for electrical equipment and materials will be found in ASA, in NEMA, and in IPCEA — and some nowhere. Occasionally, as with power circuit breakers, ASA and NEMA are almost, but not quite, identical.

When a standard contains a good list of tests, it can be included by reference, thereby reducing the volume of words in the specification. But a note of caution is necessary. To order tests, it is not sufficient merely to name the tests, it is necessary to state in unequivocal words that the tests shall be

made. Simple reference to the standard will not always do this, as many of the standards do not clearly state that the listed tests must be made on every unit produced and supplied. An example, which at first glance seems clear, becomes hazy upon careful analysis. It is NEMA Standard SG5-1955, paragraph SG5-4.15, entitled Dielectric Tests at Factory. This states:

"Sixty-cycle high-potential tests shall be made at the factory on each assembled switchgear structure in the same manner as defined in SG5-4.09. Impulse tests are not included in standard production tests."

The intent of the authors of this requirement is not clear. Do they mean that the tests *shall* be made and at the place and in the manner prescribed, or *when made* they shall be made at the place and in the manner prescribed?

Many other statements occur in the standards which are even less specific. To save words the specification writer often is tempted to assume that the reliable manufacturer will do the right thing, if only in his own interest. However, when buying for price in a world market, all degrees of reliability and self-interest are likely to be encountered. There can be no adequate substitute for the unequivocal statement. All tests are an item of cost. No loophole should be left for the cost-conscious supplier; no chance for the reliable supplier to make a perfectly honest error of omission.

Protection for the Consultant

The clear-cut statement is also a protection for the consulting engineer. Too often, his client is apt to read into the hazily worded statement the maximum service for his money. Even when the consulting engineer's liaison with the client organization is through fully qualified and informed engineers, there may be others in managerial and fiscal positions who develop unduly optimistic ideas. When disappointment results, they naturally blame their representative in the transaction — the consulting engineer.

On some projects, more than routine testing can be justified for some classes of equipment and materials. These almost certainly will be the basis of an extra charge by the manufacturer. The consulting engineer's problem is to determine how much of his client's money he is justified in obligating, to assure a sound installation that will perform economically. Frequently, a satisfactory approach can be established by consultation with the client, but he sometimes requires education. Tests which cost extra are not going to be included in the supplier's quoted price unless the specification clearly requires them, and the consulting engineer is obligated to see that his client understands this. If the specification is hazy on this point, the cost of the tests may be included in the quotation, in which event the consulting engineer will be put in the embarrassing position of obligating his client for the cost of tests that were not intended or, eventually, not even made.

Obviously, the research and cataloging required for proper specification of factory acceptance tests is quite a problem. There are other problems, some of which are decidedly technical in character. One of these is the possibility of piggy-backing into a specification a whole series of tests that were not meant to be included. This comes about by including a standard or other source by indiscriminate reference, which in turn may include one or more additional standards by reference, to cover the qualifications of some of the component parts or materials. These secondary reference sources may, and properly so, require extensive tests on the components, but not at the time and place or under the conditions called for in the procurement specification.

Specifications of government agencies, especially Federal, are particularly subject to this concatenation of test requirements. Suppliers dealing regularly with agencies using such specifications are on the alert, but many a newcomer to the field has seen his profits seriously impaired and his schedule of deliveries disrupted by demands for tests he did not know he had to run. Even the industry standards involve a certain amount of this. The standards for varnished cloth insulated cables are ASA No. C8.13-1960, IPCEA No. S-62-375, and NEMA No. WC4-1960. In the ASA standard, section 7 deals with the tests on the completed cable. Other tests on some of the components are included in other sections, but references are included to ASTM specifications (now adopted by ASA) which include many more detailed tests. To be sure, it is intended that these additional tests will be made on the components themselves, but at the appropriate time and place, not as part of the cable order.

Piggy-backing of tests can result from other portions of a specification than the section dealing specifically with tests. Suppose, for example, that a specification is being written on an assembly of electrical equipment connected by copper bus bars. The writer may wish to assure the high quality of the material used for these important components, and therefore may state that they shall conform to ASTM Designation B187-58, now also identified as ASA Standard C7.25-1959. This reference describes a number of tests. It is a moot question whether the inclusion of such a reference carries the requirement that tests described therein must be performed as part of the contract which includes the reference. Also tending to confuse is the typical ASTM inspection paragraph, which in B187-58 is paragraph 17. It states: "The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with this specifica-

tion . . ." It is apparent that the author of a procurement specification must find some way, in the face of considerable difficulties, to be sure of getting what he wants – and no more.

Another factor influencing tests is the manufacturer's practice of not making complete assembly of equipment at the factory. Some porcelain insulating components never get to the equipment supplier's shop, but are shipped directly from the porcelain supplier to the ultimate consumer. This practice is followed in the case of large oil circuit breaker bushings, with pertinent standards recognizing the fact and making allowance for it. The practice also is common for many items of high tension outdoor switching equipment, but is subject to considerable variation among the suppliers, with further variation by reason of the ultimate destination. Here the standards make allowance for these practices by the simple expedient of being almost completely silent on the subject of tests. Under these circumstances, the engineer will try to avoid ordering tests that may interfere seriously with some suppliers' practices, and still keep all competitive bidding on a uniform basis. This may, on occasion, be extremely difficult to effect.

Sometimes tests beyond the routine range require such elaborate or unusual test facilities that they are beyond the capabilities of a small, but otherwise qualified, supplier. Indeed, as equipment and ratings get bigger, some tests are taxing the facilities of even the best equipped shops. Thus, the specification writer will do well to investigate the potentialities of suppliers' test equipment and procedures before calling for tests which, though otherwise commonplace, might be extremely costly for equipment items of extremely high rating.

As a final hazard to proper test specification, there is the problem of words and their meaning. Depending on the nature of the equipment, specifications are apt to be rather voluminous. Actually, neither size nor the lack of it is a sound measure of the quality of a specification. It takes just as discerning an eye to differentiate between a wealth of information and mere quantity of words as it does to differentiate between the concise statement and the inadequate treatment. By the time the specifications writer reaches the subject of tests, he may be just a little fagged. He also may be slightly appalled at the volume of words he already has produced. At this point, many specifications writers are inclined to give stepchild treatment to the "few dollars" that may be involved in tests.

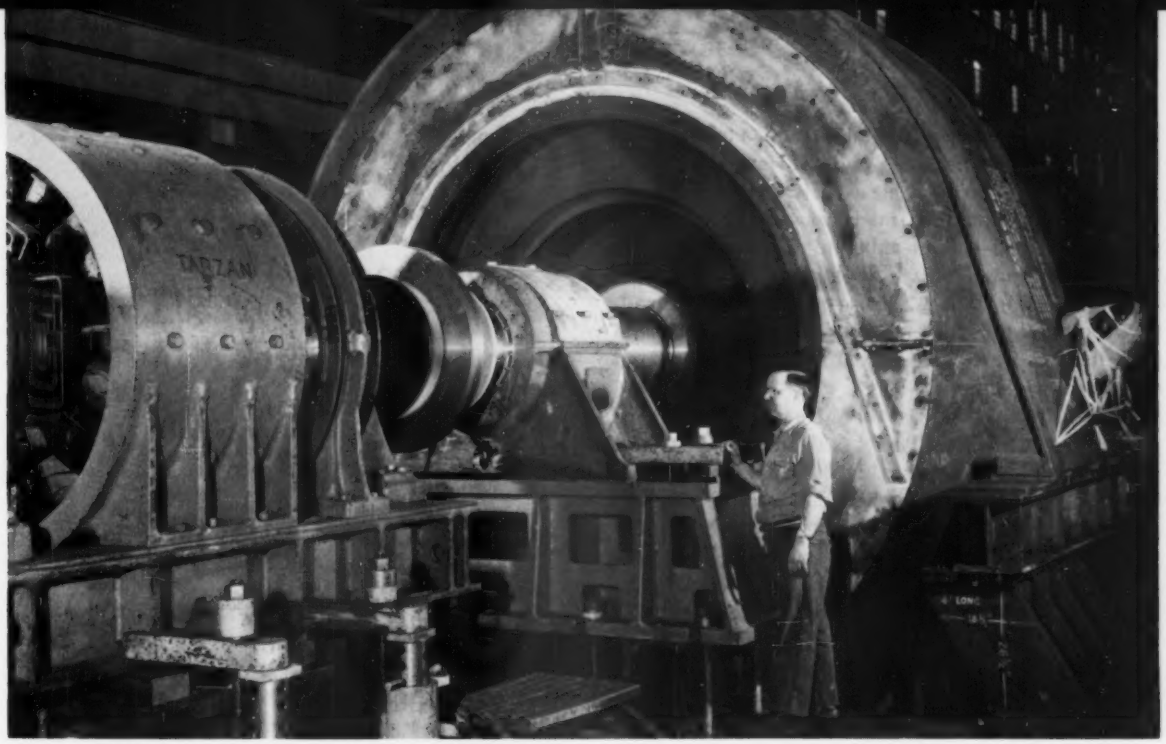
The witnessing of tests, once they have been properly included in the specifications, also creates complications for the consulting engineer. This, of course, applies to the formal witnessing of tests, not the simple inspection of the product by the purchaser's representative, or even his presence at some of the tests, where he may be welcome as long as he appears in an unofficial capacity.

Witnessing of tests requires coordination of the factory schedule with the visit of the inspector. This can disturb the factory schedule, and, in fairness to the vendor, he should be properly advised at the time of submitting his bid as to which tests he must coordinate with the inspector's visit. Another complication may arise in connection with individual components that are tested at the time and place of their origin. A conscientious inspector, operating under a broadly worded inspection clause, might refuse to approve the use of some component materials or parts which the vendor had accumulated without formal witnessing of tests, as the result of an honest but narrow interpretation of the inspection requirements. This could seriously upset the production schedule. In some instances, vendors follow the practice of performing the test twice, once in advance of the formally witnessed test, and again when the witnesses are present.

These are some of the circumstances that lead to extra expense in connection with the witnessing of tests. The duplicated tests are a clear case of added cost. Other such cost additions will depend upon the nature of the equipment and the type of test. In some instances, the vendors actually list a price addition for this service, as they do for motors.

Thus, if only to clarify the price basis, the specification writer should be as specific as possible in the matter of witnessing. A further element of cost is the time and travel expense of the inspector. With some kinds of equipment, involving components assembled from widely separated geographical locations, a loosely worded inspection requirement could lead to needless and pointless time and travel on the part of an inspector.

As with the tests themselves, a reasonable schedule of inspection will depend upon the nature of the material or equipment involved and the requirements of the project. One manufacturer of oil circuit breakers has found that it takes an inspector about a day to perform the essential inspections on from one to three breakers, whereas, if he witnessed all of the production tests prescribed by ASA, he would be in and out of the factory over a four-week period. Furthermore, the tests normally are performed over two shifts of the work day, and some of the components, such as tanks, lift rods, guide assemblies, and bushings are not normally earmarked for a particular order. The inspector's method of operation under these circumstances deserves careful definition. Frequently this can be deferred until just before the tests are due to be made. But if additional charges may be incurred or if inspection does not remain under the control of the originator of the specification, it will be wise to incorporate the originator's intent in the document.



Motor on test at Allis-Chalmers plant is 6000 hp, 1150 v, 100 percent pf, 240 rpm, type AKG synchronous unit.

Acceptance Tests . . .

Motors

THIS discussion is limited to acceptance tests for integral horsepower, polyphase, squirrel cage induction motors. Tests include those which should be made on all motors of this class, to establish their electrical and mechanical integrity and yield additional useful information. These tests should include:

(a) Commercial frequency dielectric withstand tests on windings
(b) Inspection of bearings
(c) Measurement of locked rotor current
(d) Measurement of winding resistance
(e) Measurement of no-load current and speed at normal voltage and frequency

When the size or service requirements of motors are such as to assume greater importance, additional tests can be justified. When more than one such motor of a particular size and type are being purchased, the additional tests should be ordered for only one of the group. Without setting any criterion as to size or kind of service, which could vary widely, these additional tests ought to be included:

(f) Determination of starting torque
(g) Determination of break-down torque (calculated)
(h) Measurement of full-load slip
(i) Determination of efficiency at 100, 75, and 50 percent of rated load
(j) Determination of power factor at 100, 75, and 50 percent of rated load
(k) Full-load heat run
(l) Measurement of insulation resistance

Even further testing may be warranted. For some large 3600-rpm motors, a running test, recording vibration and noise level (not radio), may be advisable. This test would be justifiable on all units of a group of like motors. If a motor is to drive a load having large WK^2 (WR^2) it may be advisable to find the time of acceleration from standstill to running speed, to set the overload protection properly.

Motor Test Standards

Acceptance tests for motors are treated in the following pertinent standards:

¶ ASA – C50.2-1955 includes a section on tests
C50.20-1954 is the applicable test code
¶ AIEE – No. 500 is ASA C50.20
¶ NEMA – MG 1-1959 includes a section on tests

ASA Standard C50.2 is the general standard for induction motors, and some other machines. Con-

sequently, its treatment of tests is understandably on the light side. Sections 2-4 and 2-13 are devoted to tests, but do not offer a clear-cut statement of what tests must or should be made for any specific purpose. Section 2-4 does tabulate a group of tests identified as routine tests for polyphase integral-horsepower induction motors. Those applying to squirrel-case motors are items (a), (c), and (e). As may be expected, the Test Code is comprehensive in its coverage of test methods.

NEMA MG 1-1959 is the general standard for motors and generators. Part 4 is devoted to tests and performance characteristics. Here again, the specific treatment of tests leaves something to be desired. Section 4.26 deals with routine tests, which, for the motors under consideration, turn out to be the same as those in ASA C50.2. Section 4.31 provides a good reference on the method of measuring machine noise.

The manufacturers have developed their own groups of tests used in normal production. They are known in the trade as the Short Commercial Test or Standard Commercial Test. These will be made without charge (if not witnessed) and vary somewhat among the manufacturers. A survey of the pricing sheets of 4 major manufacturers yields the following:

¶ One manufacturer provides tests (a), (b), (c), and the current part of (e)

¶ Two manufacturers provide tests (a), (b), (c), (d), and the current part of (e)

¶ One manufacturer provides tests (a), (b), (d), and the current part of (e)

Except for the speed part of (e), which is included in the routine tests of both ASA and NEMA, it will be seen that these tests collectively cover the ground indicated by (a) through (e). Consequently, no difficulties have been encountered for several years in calling for the complete group.

The manufacturers also have a group called the Complete Test or Tests, which will be made for an extra charge. This group includes all of (a) through (k), less the speed part of (e). If a motor is of such importance, particularly due to size, that the additional tests are justified, it would seem that (1), the insulation resistance test, would be well worth the additional cost involved.

Inasmuch as there is such a variation with respect to defined tests and individual practice, the ordering instructions should be very specific. Moreover, much of the published data applies to motors of 200 hp and smaller, while many orders will include a wide range of motor sizes. Tests (a) through (e) should be called for in all instances, plus (f) through (l) or any others when warranted. They should be ordered about as they are described in the lists. Test (a) is commonly called the high-potential test, but has been renamed as shown for purposes of clarity. Note that (g) is not really a test, but a calculation.

Acceptance Tests . . .

Power Transformers

POWER TRANSFORMERS offer such a wide range of ratings and other characteristics that it is necessary to limit consideration to one class. There are different standards applicable to the several classes, and the purchaser's interests will be different for different classes, depending upon the type, size, and importance of the unit in the system. The class selected for consideration is the general class of large power transformers, either single-phase or 3-phase, of unlimited kva and voltage rating.

Desired tests include the ordinary tests that should be required on a transformer of this class, and some optional tests. The minimum should include:

(a) Resistance measurements
(b) Ratio tests
(c) Polarity of single-phase transformers, or phase relations of polyphase transformers
(d) Excitation loss
(e) Excitation current
(f) Impedance and load loss
(g) Temperature rise (one unit only of a group of like transformers, and then only when records of previous tests on a duplicate or essentially duplicate unit are not available)
(h) Applied potential
(i) Induced potential
(j) Insulation resistance of main windings
(k) Commercial frequency dielectric withstand tests on auxiliary and control circuits and devices
(l) Continuity of auxiliary and control circuit wiring
(m) Operational tests of auxiliary and control devices under simulated service conditions to assure the operability of all components, proper mechanical functioning of all parts, and correct mutual functioning of interrelated components

Of these tests, (a) through (i) are listed without detailed explanation because they are well covered

Power transformer at General Electric plant is undergoing a test specified in Test Code for Transformers.

in the standards. Additional tests that may be advisable include:

(n) Temperature rise, even though the design may have been proved previously and these test results are available. (Ordinarily, tests of this nature are specified to be made on only one unit of a group of like transformers.)

(o) Impulse tests (usually will correspond to those as commonly defined, or may be made more severe or comprehensive)

Power Transformer Test Standards

Tests are treated extensively in ASA Standards. There are no separate treatments of the subject in AIEE or NEMA Standards. The ASA Standard applying specifically to the class of transformers under consideration is C57.12.00-1958. Pertinent also is the Test Code for Transformers, C57.12.90-1958, with an assist from C57.12.80-1958, the standard for transformer terminology.

Section 12-06.011 of C57.12.00-1958 lists routine tests. Among other things, it states that these tests shall be made on all transformers, subject to certain exceptions. This is one of the more satisfying explicit cases of a standard requiring that tests shall be made. The routine tests specified are the group (a) through (i).

The ASA item corresponding to (c) describes it as polarity and phase relation tests. Actually, this should be one or the other as stated in (c). The polarity has no significance (external) in a polyphase transformer, while in a single-phase transformer the polarity is the phase relation, an accredited term.

Item (f) has been identified as impedance and load loss, to conform to the wording used in the standard. Actually, the purchaser is interested in a measurement of the percent impedance of the transformer, and a determination of its load losses. The test code and related terminology make it clear that this is what evolves from the tests specified, notwithstanding the existence of a component known as impedance loss, which contributes to losses, if not to clarity.

The standard of reference does not include (j) through (m) among tests to be made. The test code mentions the insulation resistance measurement, (j), in a very favorable light. The information it provides can be very useful during the construction period and in subsequent service, and it is recommended that it be specified.

The tests called for in (k) through (m) are only the normal checks on the soundness of accessory circuitry and equipment, such as alarms and cooling equipment. The standard of reference, in its excellent coverage of the tests on transformers themselves, seems to have overlooked the existence of such items. Any manufacturer would expect to make these tests, and they should be called for. They should not be the basis of an extra charge.

The remaining tests, (n) and (o), or any others that may be warranted, will depend upon circumstances. Care should be used in defining the exact tests desired, in terms identifiable in the standards.

For any transformer of the class under consideration, the tests (a) through (m) always should be ordered. For (a) through (i) it will be sufficient to order them under the group identity of ASA routine tests. Items (j) through (m) should be ordered about as described in the lists. Additional tests desired should be ordered in somewhat more specific terms, bearing in mind that some of the accessories may require special treatment. For instance, if the transformer includes lightning arresters or bushing potential devices, reference to other appropriate standards may be necessary.

Acceptance Power

Power circuit breaker entrance bushing, during 60 cycle flashover test at Federal Pacific Electric Company testing laboratory.

POWER CIRCUIT BREAKERS are, to some extent, an assembly of equipment rather than a single device. Thus, the specifying of tests is slightly complicated. It is necessary to distinguish between tests on the breakers themselves and tests on the accessories. While this also is true of some other items, the situation is somewhat more confused with respect to breakers because the standards applying thereto do not maintain the necessary distinction.

The tests that should be made on any circuit breaker include:

(a) Commercial frequency dielectric withstand tests on main circuit components

(b) Commercial frequency dielectric withstand tests on secondary and control circuits and devices

(c) Continuity of secondary and control circuit wiring

(d) Operational tests under simulated service conditions to assure operability of all components, proper mechanical functioning of all parts, and correct mutual functioning of interrelated components

(e) Timing tests

(f) Commercial frequency dielectric withstand test on each bushing furnished, if not so tested on the assembled breaker

(g) The usual production or routine tests on all accessories if not already performed in the course of their normal manufacture

Test (a) requires greater definition. The ASA and NEMA Standards differ markedly from the ASA Test Code with respect to the points of application of the test potential for the dielectric withstand tests. This matter should be clarified. Further, both standards recognize the common practice of not fully assembling breakers before shipment, particularly in the larger sizes. In this case, dielectric tests of only a vaguely defined scope and magnitude are required. This situation should be clarified as much as possible.

Test (f) is an off-shoot of the indefiniteness of test (a). Recognizing that it is common practice to ship the bushings directly from the porcelain plant to the ultimate purchaser, when large breakers are not fully assembled, both ASA and NEMA specifically call for bushing tests in accordance with the ASA Standard C76.1. However, a review of this standard will reveal that it does not assure the testing of bushings unless the tests are specifically ordered. Even the routine test – a dry one-minute low-frequency withstand test – is, according to Paragraph B-1, required only for a statistical quantity in each lot. Therefore (f) has been worded so as to assure the testing of each bushing. It is to be understood that it can be performed at the porcelain plant.

Test (g) may serve satisfactorily just as stated, although some elaboration to fit each individual case may be desirable. It has been included because both ASA and NEMA include, under production tests for power circuit breakers, a number of tests on accessories that clearly should be made other than on the assembled breaker.

Power Circuit Breaker Test Standards

Tests on power circuit breakers are treated in ASA and NEMA Standards. AIEE has no pertinent standards. The ASA and NEMA Standards of reference are:

¶ ASA-C37.4-1953, the general standard for power circuit breakers

Tests . . .

Circuit Breakers

¶ ASA-C37.9-1953, the test code for power circuit breakers

¶ ASA-C37.12-1952, the guide specification for power circuit breakers

¶ NEMA-SG4-1954, which is an all-inclusive standard for power circuit breakers

ASA Standard C37.4-1953 does not specify that any tests shall be made. It discusses dielectric tests in some detail, and also touches upon temperature "type" tests. ASA Standard C37.12-1952 merely calls the purchaser's attention to the fact that tests are made and records are available, but that the purchaser should state what tests are wanted, with a warning that some may involve additional cost.

ASA Test Code C37.9-1953 provides comprehensive coverage of both design tests and production tests, although the treatment is such that it is difficult to demonstrate that it establishes a minimum schedule of tests which must be made.

Part 4 of NEMA SG4-1954 deals with the subject of tests. It parallels the ASA Test Code very closely, occasionally word for word. These two constitute the actual standards coverage for tests on power circuit breakers, and they are much alike. With respect to the points of application of the dielectric tests, paragraph 4-8.8 of ASA C37.4 and paragraph SG4.04 of NEMA SG4 are in complete agreement. However, they differ from ASA Test Code C37.9, paragraphs 9-2.3.1 and 9-2.3.2.

Both ASA 37.9 and NEMA SG4 include a group of tests identified as production tests, which, with the limitations mentioned, cover the ground indicated by (a) through (g). Perhaps the most bothersome circumstance related to these limitations is that both standards state, though differently, that production tests are made on the completely assembled breaker – yet they describe tests on certain accessories which clearly would not or could not be so made. Typical of these are certain coil check tests, inherent characteristics of bushing current transformers, and integrity tests on oil tanks and air receivers. These make a review of this portion of the standards somewhat difficult, but perhaps more necessary.

Referring to the list of recommended tests, (a) if properly clarified – will be covered either by the standards or other standards requirements drawn upon to satisfy the purchaser's requirements. Note that NEMA paragraph SG4-4.23 does not actually call for a dielectric test on the assembled breaker. Items (b), (c), (d), and (e) are adequately covered in the standards. Item (f) eliminates any doubt that the bushings delivered to the customer were subjected to a dielectric test. Item (g) is a catch-all, to cover the inconsistency regarding tests on accessories. The accessories included by both ASA and NEMA are the same except that NEMA includes bushing potential devices, not mentioned by ASA.

Owing to the manner in which tests are treated in the standards, it is advisable to call for the minimum of desired tests – (a) through (g) – with some necessary clarification.

Item (a) should be clarified with respect to the points of application of the test potential, and whether each completely assembled breaker is to be tested or whether this is to be dependent on the usual practice of the supplier.

Item (f) may be taken care of automatically by the clarification of (a). Otherwise it should be included.

Item (g) may serve just as stated. However, in order to provide a check list against specific items covered by the standards, it may be well to tabulate the items that may apply in each case. These would be part or all of the following:

¶ Coil checks

¶ Bushing current transformer tests

¶ Integrity of oil tanks

¶ Integrity of air receivers, including certificate of conformance with any codes in effect at the intended place of installation

¶ Bushing potential device tests

It may be assumed that this minimum group of tests will be performed by the supplier without increase in price, although it is conceivable that some controversy may develop in the course of the suggested clarification.

More extensive tests, such as impulse tests, interrupting tests, and thermal performance tests, sometimes may be desirable. Reference may be made to the group designated as design tests by either ASA or NEMA. There will be an extra charge for these.

Acceptance Tests . . .

Metal Enclosed Switchgear

METAL-ENCLOSED SWITCHGEAR is an assembly of a multiplicity of parts of many different kinds. The area of interest is limited to those tests which are to be made on the completed gear at the assembly shop. It is to be recognized that many of the component items of equipment and materials will have been subjected to appropriate tests at their several points of origin, and that the purpose of the tests at the assembly shop is to demonstrate the integrity and satisfactory condition of their combination. If additional tests on individual components are to be performed as specifically recognized requirements of the contract, either at their place of origin or at the assembly shop, this should be set forth fully in the specification.

Considering just the minimum of desirable tests on the assembled switchgear, the following would be included:

(a) Commercial frequency dielectric withstand tests on main circuit components

(b) Commercial frequency dielectric withstand tests on secondary and control circuits and devices

(c) Continuity of secondary and control circuit wiring; and continuity of grounding for non-current-carrying parts of main circuit equipment and secondary and control devices

(d) Operational tests under simulated service conditions to assure operability of all equipment and devices, proper mechanical functioning of all parts of the assembly, and correct mutual functioning of interrelated components

The extent of the tests to be performed in compliance with the above list will depend upon the nature of the equipment and on the tests that may have been performed on individual components. Thus, if it involves drawout breakers which previously have been tested fully, the mobile elements may be excluded. Oil circuit breakers of the nondrawout type probably will be arranged for dielectric test (a) with barriers in place of tanks or oil. Operational tests (d) might include calibration, if not done previously.

When dealing with assembled switchgear it is particularly important to be on guard against the piggybacking of tests. The wording used to detail required tests and the treatment of the subject in standards used as references should be reviewed carefully. Also, in other parts of the specification the manner in which the performance requirements or other qualifications for some of the components of the assembly are specified should be given a critical inspection. It may be well to include a clause to cover the situation from the standpoint of both inclusion and exclusion, such as the following:

"It is understood that other tests, not specifically required as acceptance tests hereunder, are required to be performed upon or with respect to component materials, parts, or items in accordance with standards, trade practices, or specified qualities pertaining to these components. Purchaser has the right to require satisfactory evidence of the successful performance of such tests."

Metal-Enclosed Switchgear Test Standards

The pertinent standards for the testing of metal-enclosed switchgear are:

¶ ASA – C37.20-1955

¶ AIEE – No. 27 is ASA Standard C37.20-1955

¶ NEMA – SG5-1955

ASA Standard C37.20-1955 does not specifically require that any tests be made. It defines dielectric tests, stating that the assemblies shall be able to withstand the dielectric tests and giving the values of the test potentials applicable to the various voltage ratings of the equipment. It also mentions heating tests and wet tests.

Performance check on the job supplements acceptance testing at plant for S & C Electric Company switchgear.

NEMA Standard SG5-1955 has one complete section on tests — Section 4. The items identified as production tests are those which one can expect to be made on any of the assemblies manufactured, although the wording leaves some doubt as to whether their performance is mandatory. Standard production tests are designated as dielectric tests, sequence tests, check of control wiring, and mechanical tests, with appropriate paragraphs describing each test. An additional test is described, for the effectiveness of instrument transformer case or frame grounding.

The NEMA dielectric test corresponds to (a) and (b). Coverage with respect to (b) is not explicit, unless the presumably allowable assumption is made that equipment voltage ratings stated in paragraph SG5-4.09 refer to the rating of the portion undergoing the required tests.

The NEMA check of control wiring and the added test for instrument transformer case or frame grounding do not fully correspond to (c). A permissible method of checking the control wiring is by visual comparison with the diagrams. This does not assure circuit continuity. The grounding check should be made on all equipment and devices, not limited to instrument transformers. The NEMA sequence tests and mechanical tests do correspond to (d).

The standards contain a slight confusion as to the frequency of the dielectric test voltage. The NEMA production tests describe it as 60-cycle, with a reference to paragraph SG5-4.09. This paragraph, however, states that the frequency shall not be less than the rated frequency of the apparatus tested. Somewhat more specific is ASA Standard C37.20, paragraph 27-300, which specifies that the frequency shall be 60 cycles, except that for apparatus rated at a higher frequency than 60 cycles it shall not be less than the rated frequency of the apparatus tested. In either case, it may be necessary to waive this limitation for vendors located in an area served at lower frequency and not equipped with adequate frequency conversion equipment.

Where it is felt that the results derived from the NEMA treatment of production tests will be satisfactory, the specifying of these tests will be sufficient. It is probable, however, that the more definitive treatment afforded by (a) through (d) will, in most instances, be worth the space it requires to spell them out. There is no reason to anticipate additional charges because of this.

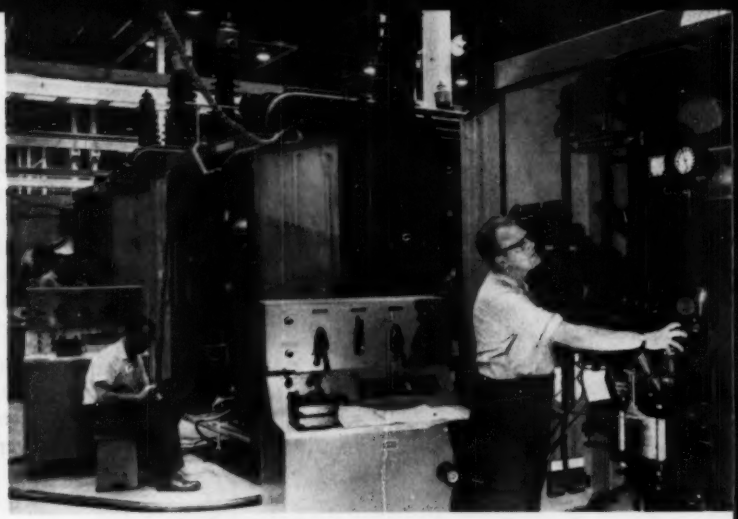
If other parts of the specification could be misinterpreted as requiring tests as a unique performance under the specific contract, it may be well to include the clarification clause on this point. This is particularly important if the specification is to accompany an inquiry, or if there is some chance that control over the interpretation of test requirements might pass out of the hands of the original writer of the specification.

Sometimes it is desirable to have some of the tests on components performed in other than the routine manner, or to have arrangements made for witnessing by the purchaser's representative. Any requirement that would take any of these tests out of their regular routine of time, place, or circumstances of performance should be made entirely clear. Some of these variations in procedure may be the basis of an extra charge.

Finally, on some projects, it may be justifiable to go beyond the simple production tests, either on some components or the assembled gear. Adequate treatment will be found in an appropriate standard for just about anything that may be desired. A simple statement that a particular test or group of tests shall be performed, incorporating their correct identity and the applicable standard reference, should be sufficient. There will, of course, be an extra charge.

Acceptance Tests . . .

High Tension Switching Equipment



Progressive in-line testing at Westinghouse Electric Corporation.

THIS class of equipment includes, among other things, single-phase and multiphase group-operated air gap switches, of both the isolator type with no interrupting ability and the air-break type with interrupting ability. Most manufacturers of this class of equipment do not make their own insulators and usually do not accumulate them for a purchase, but order them shipped direct from the porcelain maker to the purchaser. The same is true to some degree for motor operators used on power-operated units. As a result, the requirements and practices pertaining to testing have not been formalized fully.

Other switching components, such as high tension fuses, might be included, but too great a variety may confuse the issue. Therefore the class considered will be 3-pole group-operated disconnecting switches with motor operator. Tests should include:

(a) Mechanical operation of main components of one of each type, to demonstrate correct functioning of each part and of the complete assembly

(b) Routine tests on insulators

(c) Commercial frequency dielectric withstand tests on parts and circuits of all motor operators

(d) Continuity of power and control circuits of all motor operators

(e) Operational tests on all motor operators under simulated service conditions to assure the operability of all components, proper mechanical functioning of all parts, and correct mutual functioning of interrelated components

It will be necessary to define the meaning of the word "type" in (a). It might signify one of each item on a particular order, or, where there are only minor differences among some items, it might differentiate according to such factors as voltage class or mounting. For (b), reference should be made to the appropriate industry standard.

These tests should be considered routine. More searching tests, of a design nature, might be deemed desirable in some instances. These could include:

(f) Impulse test on one assembled main unit of each type, in which the type classification may differ from that for (a)

(g) Thermal performance of one assembled main unit of each type, with distinction of types

(h) More than routine tests on insulators

High Tension Switching Equipment Test Standards

Tests on switches as an assembly are treated in AIEE Standard 22-1952 and NEMA Standard SG6-1960. These standards do not require that any of the tests be made, as they are primarily design tests rather than production tests. If an order includes specialty items, these sources can serve as references for tests out of the usual routine. However, the purchaser ordinarily will be ordering switching equipment of standard design, on which fully assembled tests usually are not made, and not proposed. Note that (a) can be performed with dummy insulators.

Tests on the insulator components are treated in other standards, all of which happen to be joint standards. (EEI is the Edison Electric Institute.)

¶ AIEE 41-1944 and ASA C29.1-1944 — insulator tests

¶ AIEE 29-1941 and ASA C77.1-1943 — wet tests

¶ NEMA 146-1956 and EEI TDJ-58 — wet process porcelain insulators (apparatus-cap and pin type)

¶ NEMA 147-1956 and EEI TDJ-59 — wet process porcelain insulators (apparatus-post type)

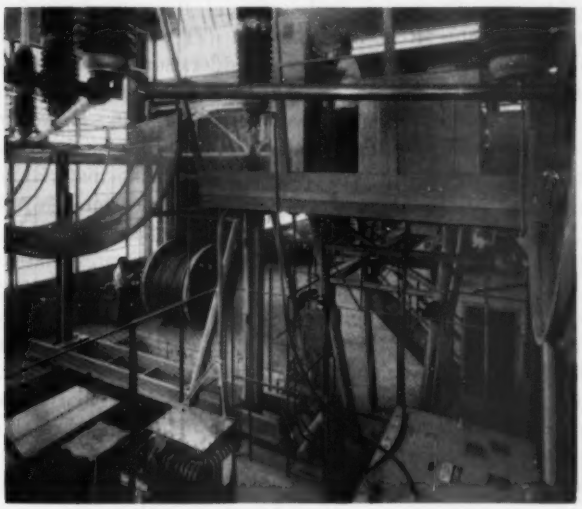
NEMA SG6 also treats insulator tests, but leans heavily on the combined AIEE 41-ASA C29.1 and and therefore is not listed independently.

The joint NEMA-EEI Standards can serve satisfactorily as a reference for (b), the routine tests on insulators. Each for its own type — cap and pin or post — states what tests should be made as routine tests, and, furthermore, states that tests shall be made on each insulator. The tests required are a mechanical test in tension, and a dry flashover test

at either high frequency or low frequency. Details for performing the tests, are given in the joint AIEE-ASA Standard for insulator tests.

The tests recommended for the motor operators are not treated specifically in the standards in connection with switches. They may be considered, however, as corresponding to the requirements for similar equipment and constitute nothing out of the ordinary. They should not be overlooked when switches having such accessories are being purchased.

The minimum of desired tests for switches of the type under consideration should be (a) through (e), with proper clarification of the meaning of "type" in (a) and reference to the appropriate NEMA-EEI standard for (b). None of these tests should involve an extra charge. There may be other tests, regularly made, in which the purchaser may be interested, and for which he may be entitled to receive information or allowed representation without extra charge. Other more elaborate tests are apt to involve extra charges.



Acceptance Tests . . .

Cable

Cable undergoes final testing before shipment from high voltage lab of Anaconda Wire & Cable Co.

CABLE presents a unique test situation. Not only does it come in a wide variety of sizes and types, but the art has been, and probably always will be, under continuous development. The pressure for change has come from the progressive efforts of both users and makers. But there also is a resistance to change because of relatively high cost, the great quantities used, the demand for long service life, and the tendency to cling to materials and types that have proven themselves in practice.

The test problem is further complicated by the many large volume users who have developed their own specifications, including test schedules. When a consulting engineer has such an organization for a client, he naturally will give much weight to its established practices. For other clients, however, he must be guided by his own judgment, prevailing practices, existing industry standards, practices of the manufacturers, and the class of cable involved.

The art of cable testing has developed along with the art of cable design, and is well documented, but there is no good guide as to what the minimum tests should be for any particular project, or how much the purchaser can expect without paying extra. By reason of understandings in the trade, this situation presents no problem to the cable specialist, but it leaves the general consultant somewhat at sea.

The meaningful tests will depend upon the makeup of the cable, such as the material of the conductor and insulation, and the nature of the covering and other components. Other variants influencing tests include the amount of cable on a particular order, the size of the conductor, and the voltage class. Thus, it is necessary to select a very specific example for discussion. It will be assumed that an order has been placed for 10,000 feet of single-conductor cable, 1000 MCM stranded copper, tinned, 15 kv butyl rubber insulation, copper shielding type, and neoprene jacket.

There is an industry standard which applies to this item as one of many rubber-insulated power cable constructions. If the cable has been ordered in accordance with this standard, without further detailed specification as to what tests should be made, there is a general understanding that the specific tests are designated by the standard. This is not quite true.

Cable Test Standards

The industry standard applying to the cable item under consideration is the joint IPCEA and NEMA Standard for rubber-insulated wire and cable for the

transmission and distribution of electrical energy, IPCEA No. S-19-81 and NEMA No. WC 3-1959. It consists of 8 parts, as follows:

(1) General
(2) Conductors
(3) Insulation
(4) Shielding and coverings
(5) Cabling, fillers, binders, and circuit identification
(6) Testing and test methods
(7) Construction of specific types
(8) Appendices

Part 6 is not a compendium of the tests that should or could be made on specific kinds of cable, as might be hoped. It is necessary to derive these tests from a combined survey of Part 6 and the several other parts, selecting those which apply. Even when this has been done, the result is simply a list, with no firm indication as to the mandatory nature of each test.

Part 6 starts out by stating: "All wires and cables shall be tested at the factory to determine their compliance with the requirements given in Parts 2, 3, 4, 5, and 7." But when it takes up the first item considered – conductors – it immediately pulls the teeth of "shall be tested" by starting paragraph 6.3.1 with: "When tests are required for . . . in accordance with 2.1 . . . " This is perhaps just as well, for Section 2.1 introduces the ASTM specifications, which, it has been found, could involve the piggy-backing of many detailed tests. The industry has interpreted the situation as requiring that the manufacturers maintain quality controls that insure the more intrinsic characteristics of the conductors, such as their chemical and electrical qualities, while the purchaser's representative is entitled to a check of the dimensions.

Section 6.4.1 states that the "physical and aging tests include . . . as required in Parts 3 and 4." The portion of Part 3 that deals with "ozone-resisting butyl rubber" is Section 3.15. Subsections 3.15.1 and 3.15.2, dealing, respectively, with physical and aging requirements and electrical requirements, both start out with the conditional approach, "When tested in accordance with . . ." Notwithstanding, the industry has interpreted this to mean most of the described tests will be made, but not necessarily all.

This lack of positiveness as to whether a particular test must be made is rather common. To clarify this situation, a list of tests applicable to the cable item under consideration has been drawn up and the prevailing practices surveyed. The items in this list have been stated in such a way that their nature is either self-evident or can be identified with specific tests named and described in the standard. The tests are:

(a) Quality control tests on conductor
(b) Complete physical and aging tests on insulation
(c) Complete physical and aging tests on jacket
(d) Dimensional analysis of finished cable
(e) Preliminary voltage test, a-c
(f) Preliminary voltage test, d-c
(g) Insulation resistance measurement
(h) Final voltage test, a-c (dry)
(i) Corona level
(j) Continuity of shielding tape
(k) Short time dielectric strength
(l) Ozone resistance
(m) Accelerated water absorption (electrical gravimetric)
(n) Measurement of capacity and power factor
(o) Cold bending and long time dielectric strength

Discussion with some of the manufacturers indicates that (a) through (i) would be performed on the cable under consideration if the cable were ordered in accordance with the standard referred to, and no mention were made of tests. However, (a) comprises the quality control tests and would not necessarily be made on the specific material for the particular order. The other test items would be made with respect to the particular order, and could be witnessed by the purchaser's representative.

There is some doubt whether the remaining tests – (j) through (o) – would be made. One source indicated that (j) through (m) probably would be made without specific mention in the order, and without extra charge. Also, (n) is regularly made as a quality control on all insulation batches, but not necessarily on the portion assigned to a particular order. However, upon request, the test would be made on an assigned portion, without charge.

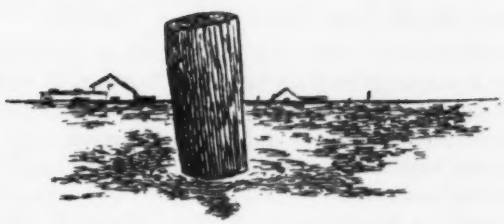
In view of the method of presentation in the applicable standard, it would seem wise to incorporate in the order a specific listing of tests to be made. One mitigating circumstance is that many large cable buyers have been repeat customers, and a mutual understanding usually exists between the manufacturer and the purchaser's representative. This "working agreement" is commonly accepted in the trade, because working up comprehensive test lists could be a substantial chore. Nevertheless, there still remains the problem of the consulting engineer's obligation to protect his clients' interests fully.

Assuming that listings of tests are to be made, (a) through (i) provides a satisfactory minimum for the particular cable under discussion. It is probable that other items in the list could be added without incurring much extra cost. The important fact is that we have a list for the particular item, and therefore a means of clarifying the requirements.

In preparing test lists of this nature, clarification is the basic purpose. The lists need not be complicated or expanded by inclusion of the several variants that actually may prevail in certain situations. On the other hand, it could be particularly important to indicate that a desired test be made, when that test ordinarily would not be made. ▲▲

Flood Control . . .

Average Annual Benefits



JOSEPH B. FRANZINI
Stanford University

ESTIMATING THE AVERAGE annual flood damage is a problem often encountered in the economic analysis of flood control projects. Associated with this is the need to set the average annual benefits resulting from the construction of physical works capable of accommodating large floods or of reducing flood peaks.

Over a long period of years ($N \to \infty$) the flood of greatest magnitude has a recurrence interval, T_r, of N years, the flood of second magnitude will have a recurrence interval of N/2 years, the third largest flood a recurrence interval of N/3 years, and so on. P, the probability of occurrence in any year of a flood equal to or greater than a certain magnitude, is the reciprocal of the recurrence interval of the flood having that magnitude, i.e., $P = 1/T_r$. Thus, for example, there is one chance in 20 that a flood equal to or greater than the flood of 20-year recurrence interval will occur in any given year. Usually, the flow record on a stream is not long enough to assign to the flood of largest magnitude a recurrence interval $T_r = N$. Rather, one must resort to a frequency analysis of peak flows* to determine the recurrence intervals for floods of various magnitudes.

Assume that adequate hydrologic data on a stream is available so that the relation between flood peaks and T_r can be determined as shown in Fig. 1, Curve A. Next, suppose that an estimate is made of anticipated flood damage in dollars for floods of various magnitudes, as plotted in Fig. 2. The foregoing items of information can be combined into a single curve, Fig. 3, showing the relation between probability of occurrence and estimated dollars of annual damage. Curve A of Fig. 3 shows, for example, that during the next year there is a 5 percent chance that a flood inflicting at least $210,000 of damage will occur.

The average annual flood damage D_{av} on a stream can be determined by summing up the individual

*One method is that of Gumbel. See *Hydrology for Engineers*, Linsley, Kohler, and Paulhus; McGraw-Hill, 1959, pp. 250-58.

TABLE 1

D	$\frac{D_1 + D_2}{2}$	P	$(P_2 - P_1)$	$\frac{D_1 + D_2}{2} \times (P_2 - P_1)$	Σ
500		0.000		2.10	
	450		0.003		
400		0.003		2.38	1.35
	350		0.006		
300		0.009		1.35	3.45
	265		0.009		
230		0.018			5.83
	225		0.024	5.40	
220		0.042			11.23
	190		0.036	6.84	
160		0.078			18.07
	130		0.036	4.68	
100		0.114			22.75
	80		0.044	3.52	
60		0.158			26.27
	45		0.067	3.00	
30		0.225			29.27
	15		0.108	1.62	
0		0.333			30.89

Average annual flood damage = $31,000

flood damages over a long period of N years and dividing by the number of years. Thus:

$$D_{av} = \sum_{1}^{i=x} D_i \div N$$

¶ D_i represents the damage in dollars inflicted by the flood of ith magnitude.

¶ x is the order of magnitude of the smallest damaging flood, and

¶ N is the number of years of record.

Finding annual flood damages by the foregoing procedure is lengthy and cumbersome. A more direct approach to the problem can be made through probability considerations. Referring to Fig. 4, a probability curve similar to Fig. 3, it can be seen that the probability of having a flood damage in any one year between D_1 and D_2 is $P_2 - P_1$. Probable average annual damage can be determined from:

$$D_{av} = \left[\frac{D_1 + D_2}{2} \times (P_2 - P_1)\right] + \left[\frac{D_2 + D_3}{2} \times (P_3 - P_2)\right] + \cdots$$

where $(D_1 + D_2) \div 2$ represents the average annual flood damage caused by all floods with a probability of occurrence between P_1 and P_2, etc.

By breaking the D versus P curve into convenient spans, D_{av} can be computed. This procedure is shown in Table 1 for the example under consideration.

It should be noted that in the preceding calculations it was the area under Curve A of Fig. 3 that was actually computed. That is;

$$D_{av} = \int D\, dP$$

Thus, the average annual flood damage D_{av} could be found by planimetering the area under the curve.

Annual Benefit from Flood Control Reservoir

If a flood control reservoir is constructed on a stream, there is a change in the relationship between T_r and peak flow Q_p downstream of the reservoir. Floods of record should be routed through the reservoir in accordance with the proposed operational plans for the reservoir to determine a new T_r versus Q_p curve for this reach of the stream, as in Fig. 1, Curve B. The relationship between flood damage D and peak flow Q_p, Fig. 2, Curve A, will remain unchanged if annual damages with and without reservoir are being compared over the same reach of stream. By combining the data from Curve B of Fig. 1 and Curve A of Fig. 2, a relation can be developed between D′ and P for the stream with a flood control reservoir,

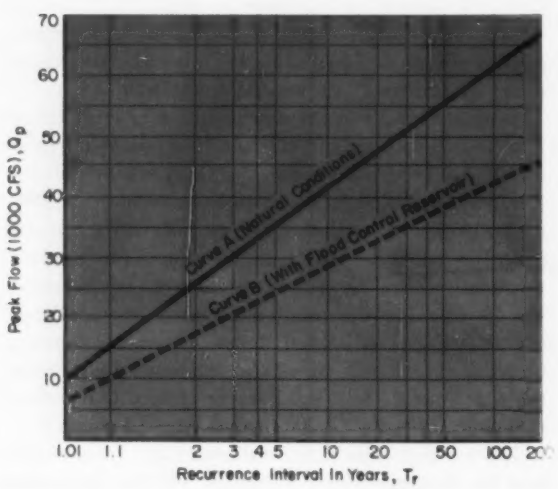


Fig. 1 — The relationship between flood peaks and interval of occurrence, with and without a control reservoir.

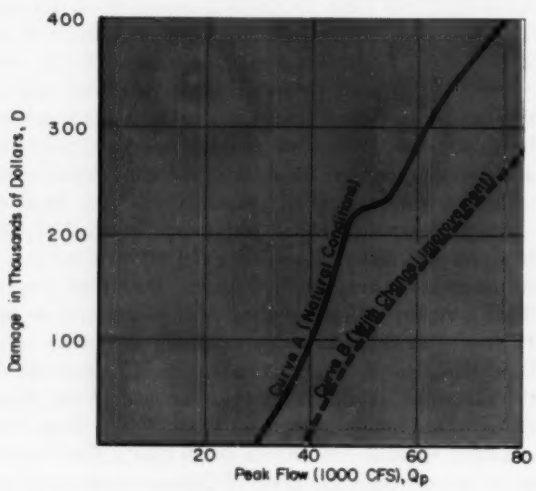


Fig. 2 — An assumption of anticipated flood damages for varying peak flow, with and without channel improvement.

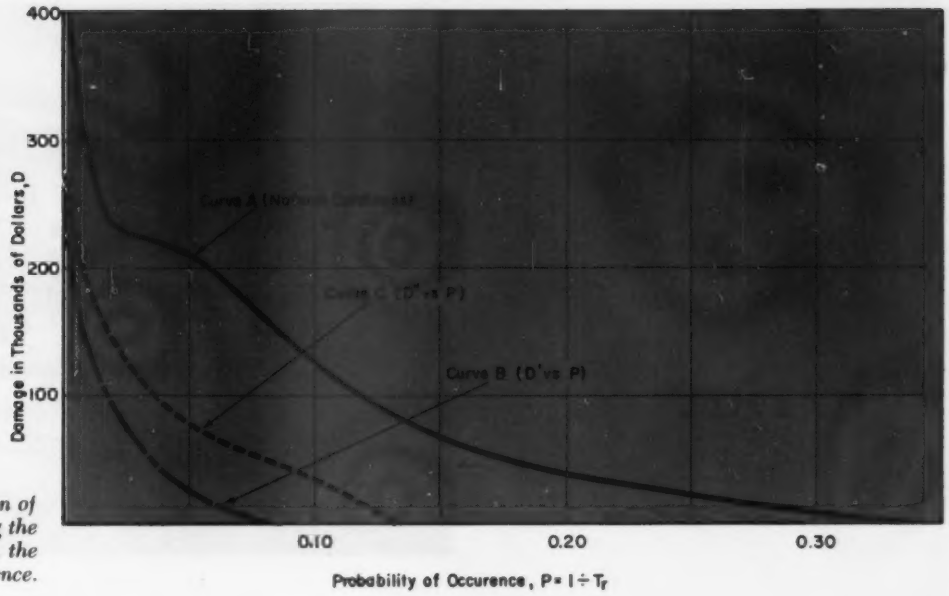


Fig. 3 — A combination of Figs. 1 and 2, showing the amount of damage vs. the probability of occurrence.

Fig. 3, Curve B. The area under this curve gives the average annual flood damage for this condition.

The average annual flood control benefits B'_{av} accruing from the reservoir are equal to the difference between the annual flood damage without the reservoir and the annual flood damage with it. That is;

$$B'_{av} = D_{av} - D'_{av}$$

which is equivalent to the difference in the areas under the curves A and B of Fig. 3.

Annual Benefit from Channel Improvement

If flood control is achieved by channel improvement, the relationship between T_r and Q_p, Fig. 1, Curve A, will remain practically unchanged.* The relation between flood damage D″ and peak flow Q_p, Fig. 2, however, will be considerably different because of the increased capacity of the channel. A new relation, Fig. 2, Curve B, between D″ and Q_p must be developed and then that information combined with the data of Curve A of Fig. 1, or modified data of that curve, to arrive at a relation between D″ and P, Fig. 3, Curve C. The annual flood control benefits B''_{av} accruing from the improvements are given by:

$$B''_{av} = D_{av} - D''_{av}$$

which is equivalent to the difference in the areas under the curves A and C of Fig. 3.

Average annual benefits resulting from flood control works which are a combination of channel improvement and a flood control reservoir can be determined by use of the preceding methods.

The solution just offered is simplified where damage resulting from a flood is independent of Q_p. For example, in an isolated area the wash-out of a highway culvert may be the only anticipated damage. If it is estimated that a \$10,000 damage will occur whenever the 20-year flood is equaled or exceeded, then the anticipated average annual damage would be $1/20 \times \$10{,}000 = \$500$. This simple approach to the determination of flood damages can sometimes be used. However, it does not consider the integrated effect of the varying damages caused by floods with differing magnitudes and return periods. The more generalized approach to the determination of flood damages should be used wherever possible. ▲▲

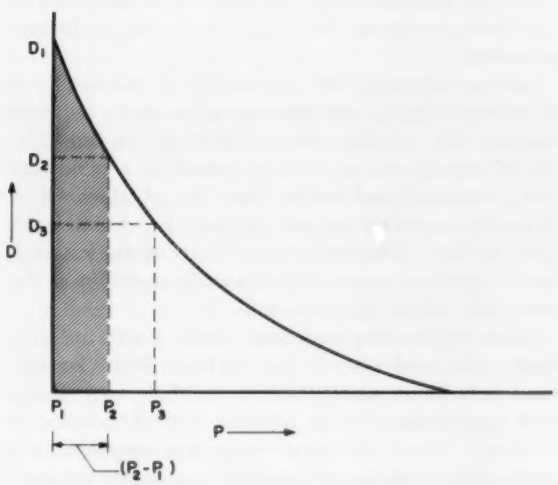


Fig. 4 — Probability curve showing chances of flood damage in any one year. Shaded area shows average damage.

*Improvement of hydraulic conditions, particularly those upstream, will shift the curve somewhat. Refined analyses should take this into consideration.

Office Facilities . . .

Rent Build Or Buy

RALPH S. TORGERSON
Western Editor

IN THE LIFE of many consulting engineering firms there comes a time to decide whether to continue renting, to build an office, or to buy an existing structure and remodel. Factors ordinarily demanding construction of a building for other businesses generally do not apply to the consulting engineer. Thus, the majority of consulting engineers continue to rent rather than own their office and drafting space, although a growing number of firms has found it desirable to build. Reduced to bare economics, the choice seems to be weighted in favor of renting. However, the locale, price of land and structure, type of engineering work, and some of the intangible benefits accruing to ownership of an office – more pleasant working conditions, ample parking space, and proximity to the homes of principals and workers – have favored building or buying.

CE exclusive

Renting Advantages

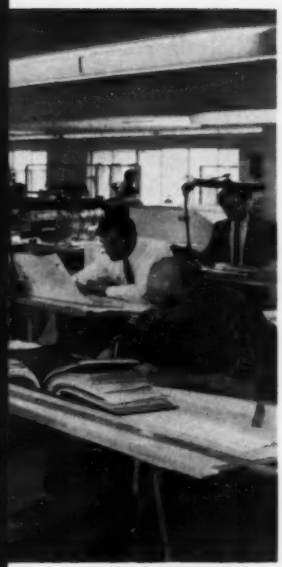
Advantages of renting include a reduction in invested capital requirements; flexibility to match changing space requirements; and a favorable tax position, since rent is a business expense deductible from gross income of the firm.

Liquidity through reduction of invested capital requirements is important for an expanding business. Money invested in real estate cannot be made readily available for expansion. Loans can be made against real estate, but generally there is a first mortgage, and second and third mortgage loans are costly. A consulting engineer does not have to hold real estate to secure short term bank loans, because credit can be established on accounts receivable, particularly if the bookkeeping is set up on an accural basis rather than on a cash basis.

Flexibility for expansion is more easily attained by renting, in the opinion of many consulting engineers. When renting, it is generally possible to rent additional space in the same building. If adequate space is not available in the same building, you always can move to larger quarters. If it is necessary to cut down on space, the renter again has a distinct advantage.

Before venturing into ownership of real estate, it is essential that a cost comparison be made between renting and owning similar facilities. In an area where rentals may be moving upward at a rapid rate and improved real estate may be obtained at a favorable square foot cost, it may be desirable to build or buy. However, in most parts of the country, rentals and real estate values usually move up at the same rate and at the same time.

Some engineering firms have found a way to "have their cake and eat it too." These firms arrange have a building erected largely to their own design and specifications by an investor, who then leases it to them. Where an engineering firm operates as a partnership with several partners, a separate corporation sometimes is set up to build and own the structure, which then is leased back to the partnership.



After considering buying a building, Koebig & Koebig decided to maintain their present rented offices in downtown Los Angeles.

TABLE 1 — OWNERSHIP COST ESTIMATE
Building 10,000 square feet gross

Estimated Property Cost:

Land	$ 70,000
Building	180,000
Total	$250,000

Assume 25 years use, no salvage value in building
Assume 25-year loan for full amount at 5% interest
Assume 25-year straight line depreciation on building

Estimated Annual Expenditure:

Interest & principal payment ($0.0709525)	$17,750
Maintenance (@ $0.04/sq ft/month)	4,800
Insurance (@ $1.45/$1000/year)	260
Taxes (@ 7.5% of 40% of $250,000)	7,500
Utilities	2,500
Total annual expenditure	$32,810
Expenditure/sq ft/year	$3.28

Estimated Annual Cost:

Interest (average per year)	$ 7,750
Maintenance	4,800
Insurance	260
Taxes	7,500
Utilities	2,500
Depreciation	7,200
Total annual cost	$30,010
Cost/sq ft/year	$3.00

Value of Property After 25 Years:

Land	$70,000
Building	0
Total	$70,000

This arrangement eliminates the problem of multiple ownership of real estate.

Ownership Advantages

Consulting engineers who have built their own offices and drafting facilities usually are well satisfied with their investment. As a rule, most of these firms are well established, and the need for liquid assets is not so compelling a factor as it is with newer concerns. In some instances, land and buildings were purchased in a period when real estate values were depressed. The owners now have the smug satisfaction of getting their space at a cost much lower than current rentals.

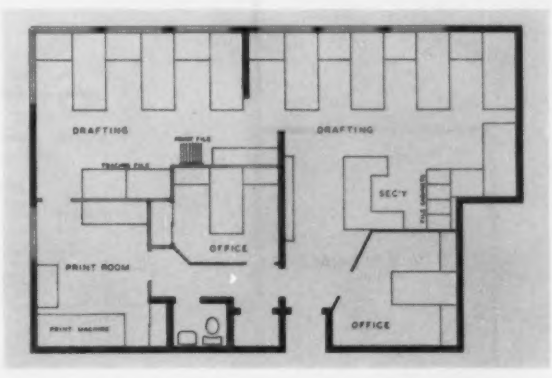
The firms that have built new offices in recent years claim many advantages. It is not essential that the engineering firm in a large city be located in the heart of the downtown area. In fact, it often is an advantage to locate in an outlying area, convenient to highway or mass transportation media. Outlying land is relatively cheap, and a parking area can be provided, as well as space for future expansion.

Firms that have built their own offices point out that a much more efficient layout of drafting rooms and administrative offices is possible when the space is planned expressly for engineering functions rather than fitted to a rented area. Also, future expansion can be handled without the inconvenience of widely separated offices on the same or different floors. Engineers can work more efficiently in the quieter outlying areas, and travel time to and from work often can be reduced greatly.

Some engineering firms have found it more economical to buy an existing structure and remodel it. Often, the building is a large residence, with ample land area for off-street parking. The purchase and remodeling of such structures may cost much less than a new building, although a remodeled structure does not offer as efficient a layout as one designed specifically for engineering office requirements. Often such properties have a potential for considerable appreciation.

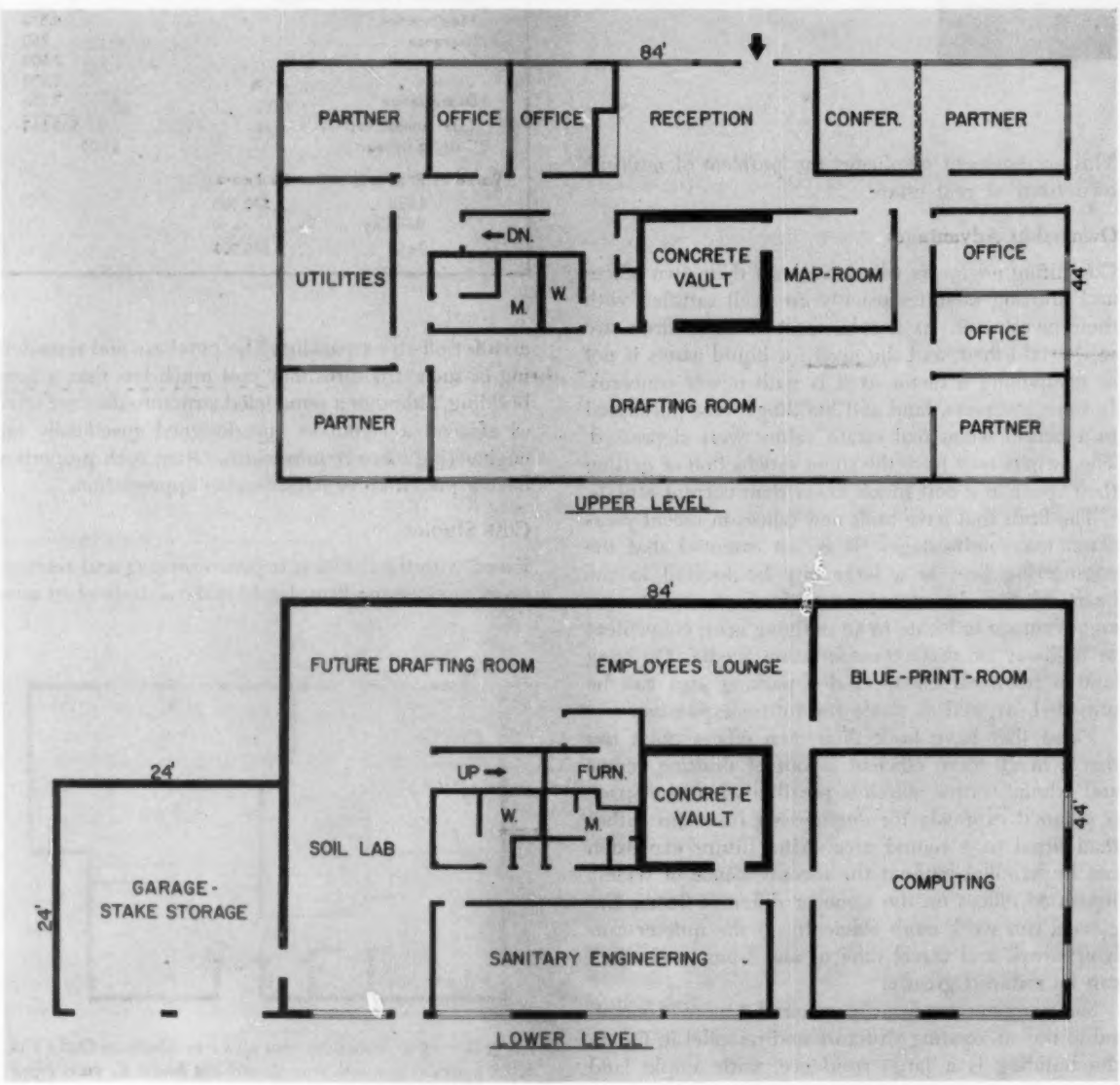
Cost Studies

Faced with the decision between owning and renting, every engineering firm should make a study of its own



King, Benioff & Associates rent space in Sherman Oaks, Cal. KBA believes a small firm should not build its own office.

Ruskin Fisher & Associates, of Seattle, Washington, leases this custom-made building from an independent owner.



particular situation. What may be wise for one organization may not be wise for another because of tax position, interest rates, need for working capital, or growth potential.

Koebig & Koebig, Inc., Los Angeles, a general engineering firm with 130 employees, recently made a survey to determine whether it should continue to rent space or purchase an office building. Its existing rental quarters, in a modern building located on the fringe of the downtown business district, with an off-street parking area, proved most advantageous. This decision was based on an evaluation, made in 1959, for a property that appeared to offer favorable conditions for office ownership. Details of the survey are shown in Table 1.

The study shows an annual cost of $3.00 per sq ft after capital recovery through building depreciation. This compares with a satisfactory leasehold for less than $4.00 per sq ft annual cost. With rent figured as a business expense, deductible from gross income before taxes, the current corporate tax structure indicated leasing to be more favorable than owning.

King, Benioff & Associates, Sherman Oaks, California, a structural engineering firm, has never considered owning its facilities, as the area required would be too small to justify the cost of ownership. The investment necessary to house a small organization can be quite large, and often can be used more effectively in financing new business, according to King and Benioff. KBA believes that ordinarily the renter will maintain a minimum facility, with the idea that a move can be made to acquire additional space, whereas the owner may build more area than he needs in anticipation of future expansion. The renter's position is also more flexible, particularly at the end of lease periods when space can be reduced or the entire location changed if conditions warrant. Renters also are located in buildings where additional space usually is available for sudden peak loads of work.

Indirect Ownership

One unique ownership arrangement prevails in the Oakland, California, headquarters of Woodward-Clyde-Sherard & Associates, where the firm's profit sharing plan owns and leases the office facilities to the firm. WCS, a soils and foundation engineering concern, with branch offices in nine cities, formerly owned many of its branch office facilities, but is taking steps to get out of the real estate business. It found that, in a growing business, capital for additional equipment and for increasing accounts receivable is more desirable than real estate.

After renting, then owning, Hill & Ingman, of Seattle, has gone back to renting. The firm rented until 1951, when a house was purchased and converted into an engineering office. This move increased the firm's floor space from 1200 to 2500 square feet, but six years later, the firm not only was using the 2500 square feet in its own building, but also some 2000 square feet in a branch office in another part of town. H&I believes that any consulting engineering firm's personnel requirements vary considerably, depending on the work load, classification of work, and location of projects. Under these conditions, it is difficult to maintain a constant flow of work which would support a stable level of employment. It is, therefore, more efficient to rent than to own office facilities.

A new engineering and testing laboratory building was built expressly for Testing Engineers, Inc., San Diego, California, and affiliated tenants, Woodward-Clyde-Sherard & Associates and A. J. Blaylock & Associates. The building is owned by Philip W. Helsey, president of Testing Engineers, and his wife, who lease the building to the three tenants. This arrangement separates real estate ownership from the professional engineering practice of the tenants, but still gives them the kind of facilities they need.

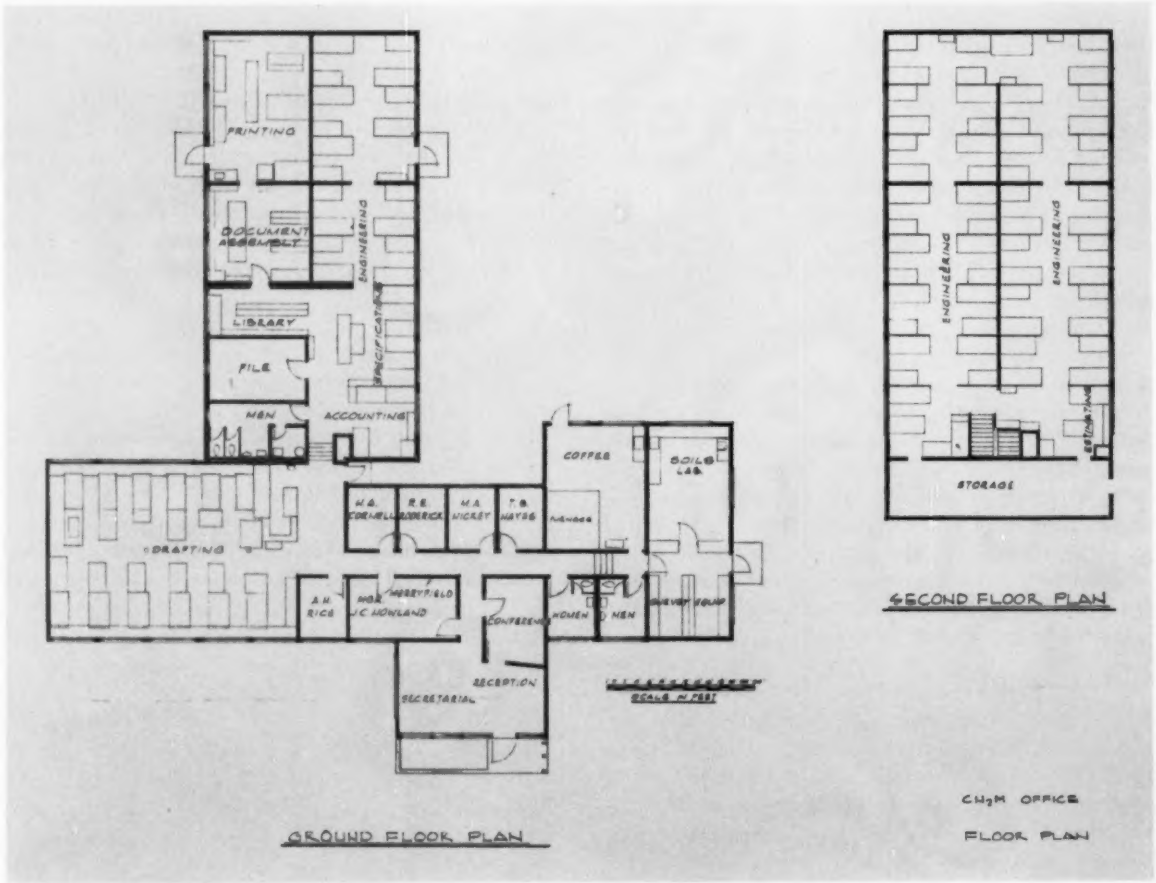
Holmes & Narver, Los Angeles, has owned its own office building for a number of years, and in 1955 it also purchased and remodeled an adjacent older building to take care of expanding needs for space. Some of its nuclear division activities and other classified work are carried on in nearby rented quarters.

Joint Ventures

Joint venture activities of considerable magnitude, carried on over a prolonged period, should be conducted in separate quarters, according to Daniel, Mann, Johnson & Mendenhall, Los Angeles. As one of the principal partners in a joint venture engaged in intercontinental ballistic missile design, DMJM elected to rent entirely separate quarters in another building. In this instance, the joint venture work was highly classified and had to be carried on separately

Stevens & Thompson, of Portland, Oregon, has found many advantages in owning and managing its own office.

Cornell, Howland, Hayes & Merryfield built, then expanded, this office building in Corvallis, Ore., for about $11 per sq ft.



from normal design work. Also, the accounting in this joint venture was greatly simplified by the establishment of separate quarters.

Professional Center

A professional engineering center, patterned after a professional medical center, was designed by Ralph M. Westcott for his own firm, Holladay & Westcott, and four other engineering firms: Wheeler & Gray, structural engineers; Helin Engineering Company, electrical engineers; Johnson & Nielsen, structural engineers; and Case & Gregory, civil and structural engineers. Three of the firms also participated in the building design.

Ruskin Fisher & Associates, Seattle, civil engineers and land surveyors, recently moved into a new build-

ing constructed for the firm but leased from the owner. The decision to lease rather than purchase made more capital available to purchase additional equipment and also to help carry the company through occasional slack periods.

Successful Ownership

Ownership and management of its own building have not presented any difficult problems for Stevens & Thompson, Portland, civil and structural engineers. On the contrary, the firm claims many advantages over the usual rental space. These include an adequate off-street parking space, a fireproof storage vault, ample space for multilith and printing equipment, a lunch room, and storage space planned to accommodate future needs. Ownership is no more expensive than renting, in the opinion of this firm, and it endorses the idea of other consultants building their own offices.

The S&T building has approximately 6500 square feet of space and cost about $10.50 per square foot. It is located on a sloping lot, 50 feet by 106 feet, allowing convenient access to each of two floors at nearly grade level. The building contains drafting rooms and administrative offices on both floors, reception room and secretarial desks on the upper floor, and toilet rooms and coat storage areas on both floors. The lower floor also contains a general storage room, multilith room, employees' lunch room, furnace room, and an ozalid process printing room with an adjoining vault for storage of drawings, prints, tracings, and other important records.

Lower floor construction includes concrete exterior walls, concrete block interior walls, and concrete floor slab on grade. The upper floor construction is a combination of steel beams and wood joists with wood subfloor, and wood stud interior and exterior walls. All interior walls are plastered. Exterior walls are a combination of stained cedar siding, some brick veneer, and painted concrete block. The roof is an asphalt composition type over wood sheathing on wood joists with fiberglass insulation. Finish ceilings are cork-type asphalt tile. Drafting room lighting is provided by fluorescent units providing 100 footcandles at drafting table level.

Heating and ventilation is by means of fan-driven, warm air perimeter type radiation, with heat provided by gas-fired furnaces to four separate zones controlled through individual thermostats. A 15-ton cooling unit provides for summer air conditioning.

Cornell, Howland, Hayes & Merryfield, Corvallis, Oregon, is another satisfied owner of office and drafting facilities. As originally built in 1949, the CHH&M single story office had an area of 3500 square feet, but three additions since then have increased the area to 9400 square feet. The main addition was a two-story wing. Total cost for construction has averaged about $9 per square foot, for the building alone. Including land for the building site, as well as land for expansion, utilities, parking lot, and landscaping, the cost has averaged about $11 per square foot – much less than the same facilities would cost if all were built at present-day costs.

The design is for minimum construction cost, with hard-board wall covering, exposed beam ceilings, and concrete or fir floors. Somewhat more elaborate construction might be justified, and probably would be required, in a larger city or a more central location.

The principals in the firm are convinced that good space is more economical to own than to rent – at least, in terms of over-all efficiency. Thus, they have tied up capital amounting to about 40 percent of their building costs, with the remaining amount financed on short-term loans. These range from 10 to 15 years, depending on the money market at the time the loans were made.

Although the Corvallis office is not downtown, it is on a main highway into the city. Thus CHH&M feels that its attractively landscaped building has definite advertising value, for people from all over the Northwest must travel past it. The firm has discovered, incidentally, that the services of a landscape architect, including planning fee and plantings, cost less than half of the proposals made by nursery men.

While owning a building may be somewhat more expensive than renting space in an older building, it is more economical than renting space in a modern building. Thus, CHH&M recently began an investigation of the possibility of building a branch office with about 1200 to 1500 square feet of space. Although the annual unit cost for such a structure will be considerably more than the rental in an older downtown building, it has been decided to proceed in the belief that improved operating efficiency and convenience are worth the additional cost.

Remodelling

Hugh Carter Engineering Company, Long Beach, California, mechanical engineers, is well satisfied with its decision to buy and remodel an old home on a busy street, which is rapidly developing into a commercial area. It also was decided to install an adequate air conditioning system. In Southern California, an August sun can bring out perspiration that will ruin a drawing which has taken many man-hours to produce in its final form.

Most of the buildings that currently provide air conditioning are in the central areas of a city where rental space is more expensive. A consulting engineer, therefore, pays a premium for a prime location even though it is not as important to him as it would be to a stockbroker or insurance firm. The consultant must go out to find his clients; he does not rely on a well-lit corner bus stop to bring them in. ▲▲

The Engineer in Public Life

T. CARR FORREST
Forrest and Cotton, Inc.

INDIVIDUALLY, the consulting engineer has both the responsibility and the privilege of serving as a member of various public boards and bodies. Collectively, he bears a broader responsibility to the public in general and to the profession of engineering in particular. It is as a profession — a group — that engineers can make the greatest impact on the public. In discussing some group efforts of engineers in public affairs, it is, therefore, understood that the terms "engineer" and "consulting engineer" are practically interchangeable.

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The first example of group effort that comes to my mind was begun under the leadership of the Texas Section of the American Society of Civil Engineers. Its goal was the passage of the Texas Registration Act. Naturally, consultants were more acutely aware of the need for the preservation of health, safety, and welfare of the general public through good professional practice than were the other members of the Texas Section. But, it was a Texas Section effort, and it was successful, although it had to be carried through several legislatures.

Range of Joint Efforts

Several other group efforts also crossed the boundaries of general practice. One was that put forth by the Texas Society of Professional Engineers working jointly with the Texas Section of ASCE. This involved the collection and authentication of information for the Texas Legislature that resulted in the upgrading of the salaries of all engineers working for the state. This presentation called for a substantial amount of research before it could be documented accurately. I

think I can say that this, perhaps, was the first time that the Texas public, as a whole, became conscious of the engineer and his contribution to society.

On another occasion, a committee of engineers was appointed, by the Texas Section of ASCE, to make a study of water problems in the State. This five-man committee (all consulting engineers) spread its efforts over a period of almost a year. It would have been impossible to purchase the time spent on this assignment for $100,000, yet these men gladly donated their services. The result was an approved publication titled "A Water Policy for Texans." The report was timely, and quite influential in steering the Governor and his One Hundred Man Water Committee in the right direction.

Engineers — as a group — also have played a prominent part in the promotion of public matters through the Texas Society of Professional Engineers public relations program. TSPE has a Water Education Committee that has developed a series of slides entitled "How We Can Meet Our Water Needs," which is offered to civic and service groups. This committee also has prepared a pamphlet entitled "Texas at the Crossroads," emphasizing the need for adequate financing of state water agencies. The first distribution of this pamphlet probably will go to 15,000 people. In addition, a number of chapters have speakers' bureaus, and speakers' kits have been compiled to aid in the preparation of speeches before local civic and service clubs.

Getting closer to home, I can cite a few illustrations that have occurred here in Dallas. The city has been fortunate in having an outstanding man as its mayor for the past eight years. He is chairman of the board of one of our largest banking institutions; he has been president of the Texas State Fair Association for a number of years; and he has attended more meetings than anyone else in fostering the development of his city and his state. In spite of his eight decades on this earth, he still can do as much work as anyone. Describing the leadership in this town, he coined the word "dydamic." It fits him precisely.

One of his first moves as mayor was to appoint a Long Range Water Committee. Significantly, he placed an engineer with a railroad president, a bank president, three industrial presidents, and other representatives of the business and industrial community on this committee. Its work extended over a period of about four years.

When he wanted a transportation study made of the downtown area, he appointed a group of consulting engineers to do the job.

Then, he felt that the city's master plan needed revision, so he appointed another committee. Here again he included engineers. Incidentally, this committee called in consulting groups that represented a cross section of the town, and in a number of instances these persons were consulting engineers and architects. Five years, 97 meetings, and many street corner discussions and telephone conversations later, the mayor received a complete revised master plan of the city of Dallas.

It is significant that no one refused these appointments. As a matter of fact, they would not have dared to do so in view of the great contribution the mayor himself was making. No one received any compensation for these services.

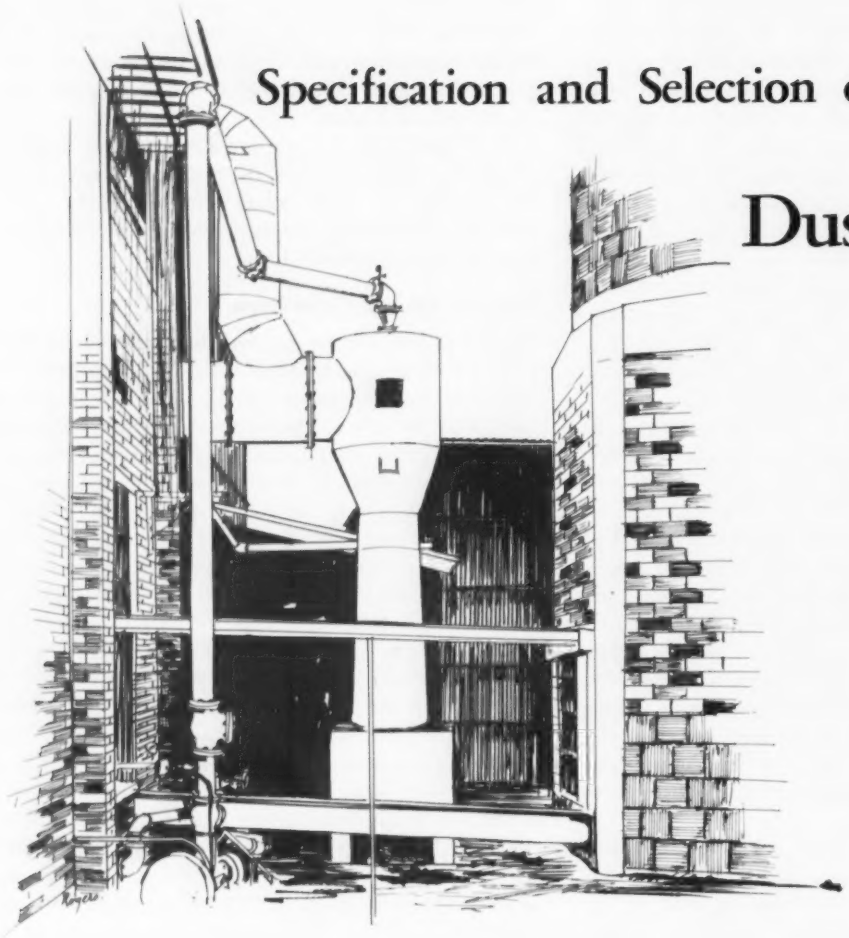
Engineer Elected Councilman

Now, I would like to get over into another interesting area which also transcends the bounds of the private practice of engineering. The Dallas Chapter of the Texas Society of Professional Engineers decided that an engineer would make a good city councilman. The Chapter made its wishes known to the Citizens Charter Association, which attempts to put forth a good slate of outstanding men for these positions. The Association acquiesced in this, and the Chapter, having already carefully screened a number of people, promptly suggested the name of an outstanding engineer. He was accepted by the Association.

Now the interesting thing is that the Chapter did not rest on its laurels at this point. It felt that it had a responsibility to see that its candidate was elected. Through a committee, it prepared a map of the city and located the block residences of every registered professional engineer in town. These were assembled in groups, captains were appointed, and every man in each group pledged to canvass the area in which he lived and acquaint people with the engineer-candidate. This candidate was a past president of the Texas Society of Professional Engineers as well as a past president and honorary member of the American Institute of Electrical Engineers. His total vote exceeded that of all the opposing candidates combined. This is still another illustration of group effort, and I can happily report that this councilman's performance has been outstanding. Needless to say, the engineers in this town now command a greater respect from their fellow citizens.

I believe I can truthfully say, for all of the engineers who participated, that these activities were rewarding ones. This stems not only from the satisfaction of their having accepted their share of responsibility toward government, but also from their exposure to outstanding citizens who happened to be on the same committees or boards. They became better citizens and are now more fully acquainted with the needs and problems of their area. They also have a more charitable attitude toward the difficulty encountered in solving perplexing problems far removed from their normal field of endeavor. By reason of these experiences they are better men — and better engineers. ▲▲

Specification and Selection of Dust and Fume



CARL R. FLODIN
Consulting Engineer

THE MAIN GAS STREAMS in the heavy process industries* have particulate solids that frequently are very different from each other as far as collection characteristics are concerned. The gases are ordinarily at high temperature (200 to 700 F); contain varying amounts of water vapor; and sometimes have corrosive constituents, such as sulfur dioxide, sulfur trioxide, fluorides, and chlorides.

CE exclusive

These industries require dust collection equipment of the heavy duty type that gives continuous performance with trouble-free operation and minimum maintenance. Consequently, specification, evaluation, and selection of the collectors, as well as associated flues, fans, conveyors, controls, and other accessories, justify careful study and thorough understanding of the individual problems. This includes a knowledge of the advantages, disadvantages, and limitations of the classes of dust collection equipment suitable for the particular applications.

*For example, aluminum, cement, chemical, clay and rock products, electro-chemical, fertilizer, gypsum, iron and steel, nonferrous metals, petroleum, pulp and paper, and power plants.

The General Problem

Inadequate and incomplete specifications furnished to dust collector manufacturers force their engineering and technical personnel to make assumptions for the purpose of preparing proposals and bids. The purchaser, or his consultant, then has the difficult task of making a fair and proper engineering evaluation of the various manufacturers' offerings.

With the increased emphasis on high efficiency collection – 98 to 99+ percent collection – in metropolitan areas, some industries must collect dust and fumes from their stack gases with little or no economic justification. Such installations may cost $1 million or more and, except for better public relations, make no tangible contribution to process economy. Thus, company managements want the most economical installations they can get that satisfy prevailing codes, rules, and regulations. Also, since the installation is likely to receive limited attention

Collection Equipment

from an operation and maintenance standpoint, it should be designed to require a minimum of operating and maintenance personnel and should be made as fool-proof as possible.

Determination of Design Data

Establishing the design data for the specifications requires tests, calculations, predictions from past experience, and possibly pilot plant work. Different approaches are required for:

¶ Existing Plants – The normal procedure is to have tests conducted on the flue gases using accepted test practices and techniques. This will include determination of such factors as gas volume, temperature, operating pressure, composition, dew point, and dust loading. Depending upon the nature of the dust collection problem, laboratory determinations of particle size and electrical resistivity as well as chemical analysis of the dust may be required.

¶ New Plants – It is necessary to calculate gas volumes, water vapor content, and chemical composition from process data. Prediction of probable dust loading, chemical composition, electrical resistivity, particle size, and related data must be made from knowledge of the raw material to be processed, type of process, process equipment, kind of fuel, and past experience with the same or similar processes.

¶ New Processes and New Applications – When new processes are involved, it is desirable to perform tests with pilot equipment. This can be done with small scale equipment that may be rented from manufacturers. It is also desirable to perform pilot tests when new applications of dust and fume collection equipment to processes are contemplated. Experience with glass cloth bag filters during the past few years illustrates this point. Use of glass cloth for dust and fume collection, except in the cement, gray iron foundry, and carbon black industries, is so limited that it can be considered almost nonexistent. For this reason, any new applications of glass cloth filters should be preceded by pilot work.

Because of the many variables that can affect the performance of dust and fume collection equipment, there are two important considerations that should be kept in mind for all pilot work:

¶ The pilot unit should be of substantial size. It should have a gas capacity of 500 to 10,000 cfm, depending upon the character of the collector and the nature of the full-scale application. The extrapolation of test results to plant sized equipment is difficult, if not impossible, when tests are conducted with laboratory equipment having a capacity of a few cubic feet of gas per minute. After pilot work is concluded, it is sometimes advisable to install an initial full-scale prototype collector on one process unit if a number of process units are involved.

¶ Pilot unit operation should be of long enough duration to be sure that the collection equipment has been subjected to as many of the probable operating conditions as possible. There are certain inherent peculiarities of collection equipment which may not become an operating problem until after an extended period of continuous operation.

Analysis of the Collection Problem

What collection efficiency or permissible emission is required by state, county, or municipal codes, rules, and regulations? Off hand, this would seem easy to determine. However, in some counties in California the regulations are based upon a permissible emission in pounds per hour as a function of weight of the material introduced into the process unit but with an opacity requirement. The opacity is based upon a Ringelmann number (Bureau of Mines Information Circular 7718). Collection that satisfies the process weight part of the regulation may not satisfy the opacity requirements.

New codes, rules, and regulations are being adopted and existing ones are being modified and revised. In view of this, it is important to know about the local situation. Many of the existing codes are based upon the old ASME Model Smoke Law, or variations of it. Regulatory bodies are generally aware that this suggested regulation was written primarily for coal-fired boilers and does not apply to many other processes. They also recognize that it is not sufficiently

stringent for congested communities with bad air pollution problems, or for suburban and rural areas having unfavorable meteorological conditions for the dispersion of air pollutants.

There are some situations where the principal reason for the installation of collection equipment is the comfort of plant personnel or the recovery of valuable constituents in the dust. For the former, efficiencies in the order of 80 or 90 percent may be satisfactory. For the latter, efficiency of collection is dictated by the economics of capital investment and operating cost for the collection system versus the value of the material that will be recovered.

It often has been said that the best way of solving an air pollution control problem is to reduce or eliminate it at the source. This involves a comprehensive investigation of the process, with particular reference to the following possibilities:

¶ Reduction or elimination of sources of air dilution of the gases, such as holes and cracks in flues and faulty hopper seals

¶ Modification of method of feeding raw material to the process to keep dusting to a minimum

¶ Change in the raw material

¶ Change in the type of fuel

¶ Modification of the process unit to reduce gas volume and dust loss

The question of whether to consider a wet or dry collection system sometimes is resolved easily, but it may require considerable study. In some chemical plants wet collection is indicated since the raw material is processed in a wet system, and the effluent from a scrubber can be introduced into the main slurry or wet system. Where waste heat or CO boilers are used, and the collection equipment is to be installed ahead of these boilers, it is apparent that only dry collection should be considered. This conserves the latent heat in the gas and avoids having to heat the water vapor that would be added to the gas by scrubbing. There are applications where the choice of wet or dry collection systems may be dictated by relative economics, availability of adequate water supply, effluent disposal, fan capacity for the pressure drop, reduction of objectionable gaseous constituents, stack appearance, and similar considerations.

TABLE I

ELECTRICAL PRECIPITATORS vs. GLASS CLOTH BAG FILTERS IN WET AND DRY PROCESS CEMENT PLANTS

(Basis 100,000 cfm at prevailing gas conditions)

	Precipitators		*Filters*
	Wet Process	*Dry Process*	*Wet or Dry Process*
Collection efficiency — %	99.5	99.5	99.5+
Electrode or bag height — ft	24	24	28
Projected area — sq ft	600	1050	1300
Size of collector — cu ft	30000	53000	78000
Pressure drop — in. wg	0.5	0.5	2.5
Power required — kw			
Rectifiers, etc.	60	100	—
Pressure drop	11	11	56
Total	71	111	56
Annual power cost at 1¢/kw-hr for 360 days	$ 6135	$ 9590	$ 4840
Estimated f.o.b. price	$90000	$150000	$80000
Erection cost	$22500[1]	$ 37500[1]	$12000[2]
Annual maintenance cost	$ 900[3]	$ 1500[3]	$ 5400[4]

1. Assumed as 25% of estimated f.o.b. price
2. Assumed as 15% of estimated f.o.b. price
3. Assumed as 1% of estimated f.o.b. price
4. Assumed replacement of one half of bags each year

Economic Evaluation

Frequently, the best type of collection system cannot be selected until preliminary letter proposals have been received from equipment manufacturers. Then, preliminary layouts can be made, and comparative installation and operating costs of the different collection systems can be tabulated and reviewed.

To illustrate, Table 1 gives comparative information for electrical precipitators and glass cloth filters for collecting the dust and fumes in the gases of both wet and dry process cement kilns. It will be noted that a filter occupies over two times the projected ground area of a precipitator for a wet process plant and about 25 percent more area than a precipitator for a dry process plant.

Other factors than comparative economics also influence the final equipment selection. For instance, when a collector installation is to be made in a northern climate and the gases have a high moisture content, condensation in the equipment during cold weather can be a serious problem. Such a combination of conditions may indicate that an electrical precipitator should be installed rather than a glass cloth filter type of dust collector.

Types of Collectors Used

Collectors commonly employed in the heavy process industries are heavy duty cyclones, fabric filters, scrubbers, electrical precipitators, and combinations of this equipment. Ordinarily, air cleaning equipment, such as air washers, air filters, and the Precipitron type of precipitator are not considered except for very specialized low temperature applications. Baffle chambers and low velocity settling chambers seldom are used in present practice.

Cyclone Collectors

The heavy duty cyclone, in its modern form, is widely used for collection of particulate solids in the larger size fractions. A dust having a normal size distribution with 30 to 45 percent less than 10 microns, such

as fly ash from a pulverized coal-fired boiler, can be collected with an efficiency of between 75 and 90 percent. (One micron is 1/25,000 of an inch and 44 microns is 325 mesh on the Tyler sieve scale.) However, collection efficiencies of this order would require a pressure drop across the cyclone of between 2 and 4 inches water gauge.

Modern cyclones have multiple collecting tubes and are either of the vane or tangential type. In the vane type the gases are given a spiral flow on entering the collecting tubes by vanes located at the inlet. In the tangential type the spiral flow of the gases entering the collecting tubes is imparted by tangential entry. These designs are illustrated in Fig. 1.

The cyclone is the least expensive of the four types of collectors. It can be used to advantage as the sole unit if substantially all of the dust is larger than 10 microns in size, or it can be used as a precleaner ahead of another collector to separate the coarser fractions of the dust from the gas. Also, there are applications where cyclone collectors can be operated in series with good results.

The principal problem with cyclones is plugging, either in the vanes or at the dust discharge cone at the bottoms of the collecting tubes. This difficulty arises if the dust has a sticky or plastic characteristic. It also may be a problem if there is an excessive amount of fine dust as compared to coarse dust. Hard and abrasive dust can cause excessive wear, particularly if the velocity of the gas in the cyclone is too high (high pressure drop). Wear also can result from poor dust seals at the hopper discharge. This also reduces collection efficiency.

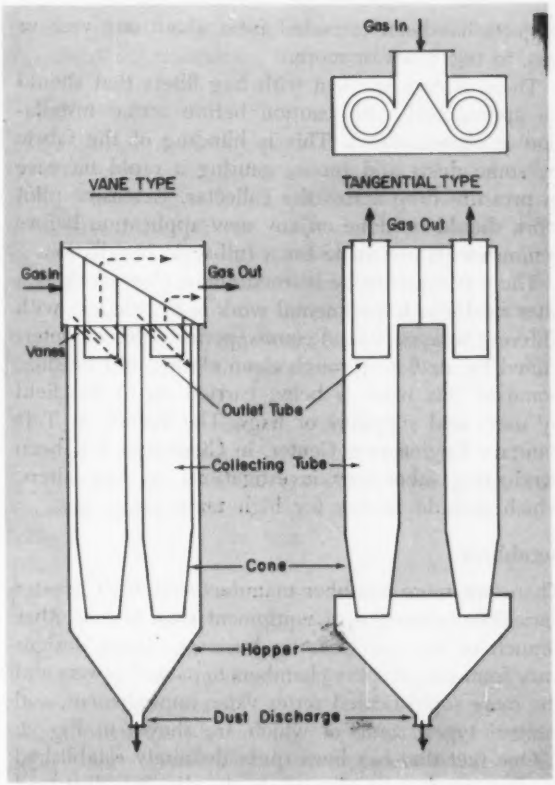


Fig. 1 — The two types of collecting tubes in modern cyclones, using vanes or tangential entry for spiral flow.

Fabric Filters

Baghouses (bag filters) have been used successfully for many years for a wide variety of dust and fume collection purposes on low temperature gas streams. The bags originally were made of cotton or wool, and it was necessary to shake the dust off the bags periodically to reduce the pressure drop across them. With the advent of nylon and orlon, these fabrics were used with gas temperatures of about 200 to 250 F. However, in the past three or four years, heat set Dacron and glass cloth have been used. Dacron can withstand continuous operating temperatures of about 275 F. Glass cloth is used up to 550 to 600 F. This has made glass cloth bag filters competitive with electrical precipitators for some applications.

The two main operating objections to bag filters in the past have been maintenance of shaker systems and bag replacement. These problems have been overcome to some extent by the use of dacron and glass cloth bags. It has been found that bags made of these fabrics can be cleaned by deflating them (interrupting gas flow) and using reverse air flow through the bags without shaking. Also, bag life on a number of

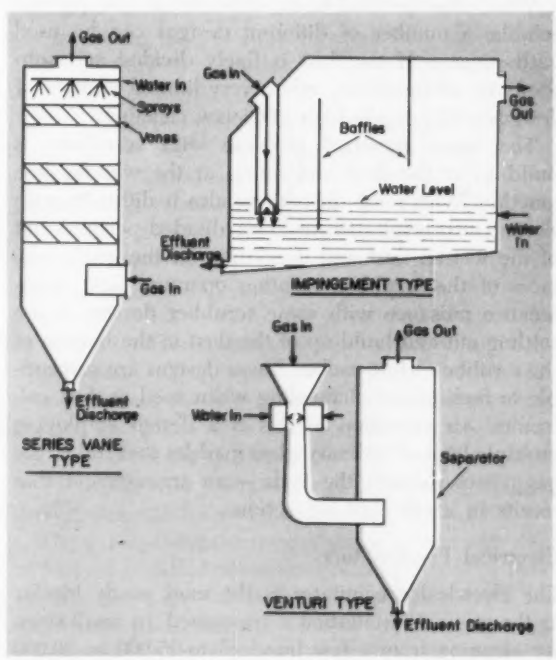


Fig. 2 — Principal types of scrubbers currently in use. Scrubber design is most varied of gas cleaning equipment.

projects has been extended from about one year or less, to two years or more.

There is one problem with bag filters that should be approached with caution before actual installation is contemplated. This is blinding of the fabric by some dusts and fumes, causing a rapid increase in pressure drop across the collector. Extensive pilot work should be done on any new application before commitments are made for a full-scale installation.

There is much to be learned about glass cloth as a filter medium. Experimental work is in progress with different weaves, thread counts, permeabilities (determined by air flow through clean cloth), and finishes. Some of this work is being carried on in the field by users and suppliers of bags. The Robert A. Taft Sanitary Engineering Center, in Cincinnati, has been conducting laboratory investigations on bag filters, which include fabrics for high temperature gas.

Scrubbers

There are more scrubber manufacturers with greater variations in designs of equipment than in any other branch of the gas cleaning business. These designs vary from simple spray chambers to packed towers and the more sophisticated series vane, impingement, and venturi types, some of which are shown in Fig. 2.

One fact that has been quite definitely established is that good collection of finely divided dust and fume in scrubbers can be obtained only by expenditure of considerable energy in the form of pressure drop, high pressure sprays, or both.

When the material to be collected is 100 percent soluble, a number of different designs can be used with success. If the dust is finely divided and substantially all insoluble, only a very limited number of designs will provide high efficiency cleaning.

The most universal problem with scrubbers is build-up of the dust and fumes at the wet-dry line junction. With some dusts there also is difficulty with sliming – precipitation of finely divided particles out of the wetted dust and deposition on the inside surfaces of the scrubber. Another operating and maintenance nuisance with some scrubber designs is the settling out and build-up of the dust in the bottom of the scrubber. Most packed tower designs are susceptible to fouling and channeling when used as dust collectors. An exception to this is a design employing multiple beds of ordinary glass marbles that roll as the gas passes through the beds – an arrangement that results in a self-cleaning action.

Electrical Precipitators

The electrical precipitator is the most costly insofar as the original installation is concerned. In small sizes, for cleaning from a few hundred to 15,000 or 20,000 cfm, the cost is very high because of the disproportionate cost of the rectifier and associated control equipment to the cost of the precipitator itself. However, for cleaning gases with high efficiency in quantities of about 50,000 to 1 million cfm or more, the precipitator should be given serious consideration, either by itself or in combination with some other gas cleaning device.

The electric utility industry is the largest single user of electrical precipitators, either alone or in combination with cyclone collectors, for collection of fly ash from coal-fired generating station boilers. A few years ago the chief engineer of one of the large midwestern utilities estimated that it had between $20 and $25 million worth of precipitators installed in its generating stations. Since that time, many more have been installed.

Electrical precipitators perform quite differently for various gas and dust conditions. Fig. 3 shows the great difference in collection efficiency that may be expected from the same precipitator collecting surface area for collection of dusts and fumes from the various process sources indicated. At 100 percent of rated gas capacity the collection efficiency for Curve A is 98%, for Curve B 92.6%, for Curve C 85.6% and for Curve D 75.4%.

Table 2 shows the comparative sizes of precipitators for various applications. The data for the curves in Fig. 3 and Table 2 were calculated approximately from a theoretical precipitation formula. They are not intended as a basis for designing precipitators. This should be done by the equipment

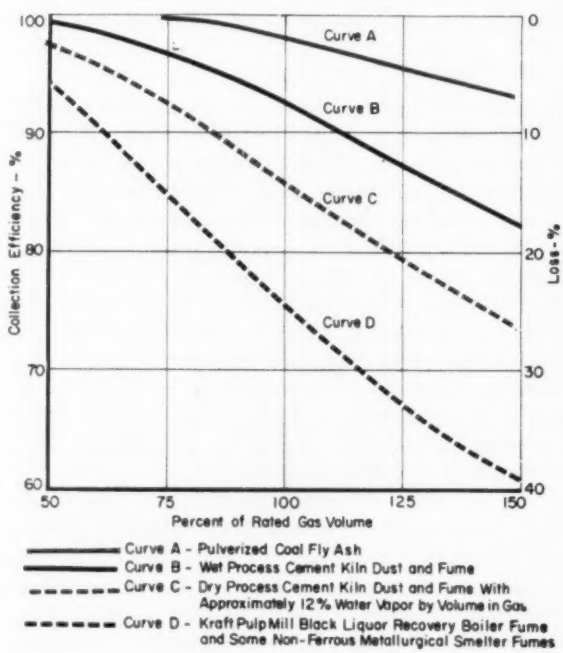


Fig. 3 – The efficiency loss of electrical precipitator collection at various percentages of rated gas volume.

TABLE 2

COMPARATIVE PRECIPITATOR SIZES FOR DIFFERENT APPLICATIONS

(Basis 98% Collection Efficiency for Same Gas Volume)

Application	*Comparative Size*
Pulverized coal fired boiler	100
Wet process cement kiln	150
Dry process cement kiln*	200
Black liquor recovery boiler	280
Some nonferrous smelter processes	280

*Approximately 12% water vapor by volume in gases

manufacturers, based upon the engineering data and information supplied in the specifications, since the guarantee of performance is their responsibility.

Other Specification Information

In addition to the information and data developed by tests, investigation, and study of the particular gas cleaning problem, there is other information that should be included in the specifications. Structural details will include wind and seismic loading; welding standards; minimum shell, hopper, and header sheet thicknesses; corrosion allowances; and suggested materials of construction. Some of the materials from which shells have been fabricated include carbon steel, fire box quality steel, stainless steels, lead, acid brick or vitrified tile, redwood or douglas fir, polyester fiberglass, and reinforced concrete. Coatings and linings for corrosion resistance have included epoxy, lead, rubber, acid brick, and Lumnite and other acid resisting cements. Parts have been alloy castings, and high voltage electrodes have been such materials as Hastelloy C and other alloy wire.

The major equipment manufacturers usually will not take responsibility for failure caused by corrosion or excessive wear. They regard such failures as being related to the process, over which they have no control. However, the manufacturers always are willing to give their best advice in these matters and to fabricate the equipment accordingly.

Precipitator manufacturers will supply alternates and extras for such accessories as automatic voltage control, recording meters instead of indicating meters on switchboards, outdoor cubical type silicon or electronic tube rectifiers, key sequence interlocks, stairways instead of access ladders, heat insulation, and weather protection.

Scale models of transparent plastic, for purposes of studying gas distribution, have become part of the specifications for some large precipitators used in utility generating stations. These models include the associated flues with turning vanes, splitters, perforated plates, and other devices for assuring good gas distribution entering the collector.

Evaluation and Selection

The engineering and technical evaluation of proposals for dust and fume collection equipment can be greatly simplified by appending a questionnaire to the specifications for the bidders to fill out and submit with their quotations. The first section of the questionnaire should cover fundamental engineering data. This can be best illustrated by listing the type of information that would be required for a precipitator:

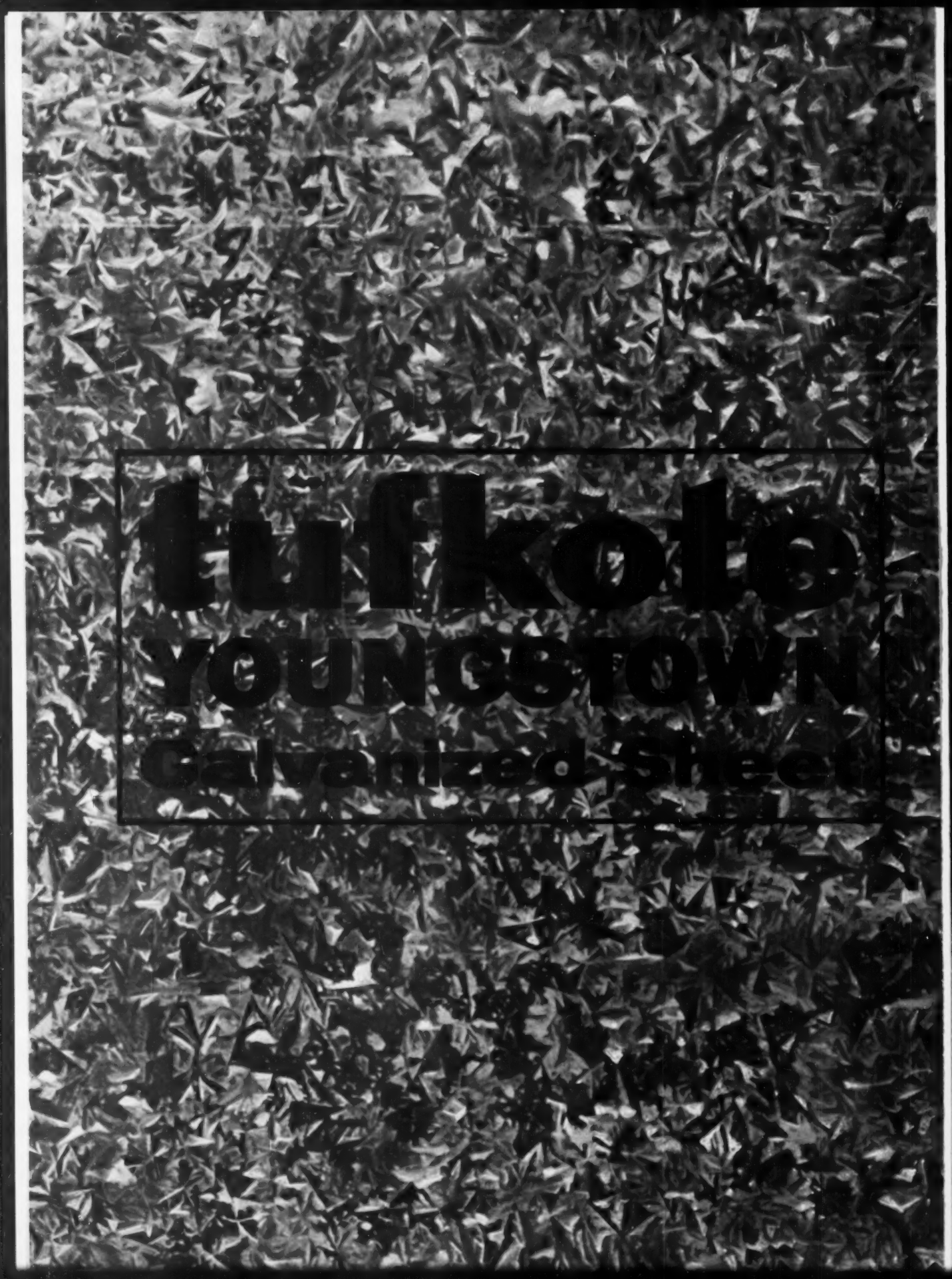
¶ Gas volume and temperature of design
¶ Dust loading
¶ Design operating pressure
¶ Guaranteed efficiency and outlet option
¶ Number of electrical sections in direction of gas flow
¶ Number of gas units in parallel
¶ Number of ducts per unit
¶ Size of collecting electrodes — height and width
¶ Square feet of collecting electrodes
¶ Effective lineal feet of high voltage electrode
¶ Throughput velocity
¶ Treatment time in electrostatic field
¶ Pressure drop across precipitator

Another section should be devoted to mechanical details, and still another to electrical equipment, which would include rectifier capacity.

For scrubbers, the important items are the scrubber liquor requirements in gpm per thousand cfm and the pressure drop. For filters one of the most important items is the gas to cloth ratio, in cubic feet per minute of gas per square foot of filter cloth, with all compartments in service, and also with one out of service for cleaning.

Final selection is the composite result of tests, investigation, study, specification, and evaluation of applicable equipment. New materials and devices adapted to gas cleaning influence final decisions. Within the past two or three years, a number of glass cloth filter installations have been made for applications where the only satisfactory collector five years ago would have been an electrical precipitator. Use of silicon rectifiers represents an advance in electrical precipitation. The trend toward automation has brought about the development of automatic voltage control using saturable reactors for varying voltage and transistors for sensing circuits. New plastics such as PVC, polyester fiberglass, and epoxy have changed design concepts for corrosion resistance.

The gas cleaning equipment manufacturers are alert to technological advances and constantly try to make improvements in the interest of lowering costs and improving performance. In view of this, the most economical and best dust collector installation selected this year may seem less attractive next year or the year after that. ▲▲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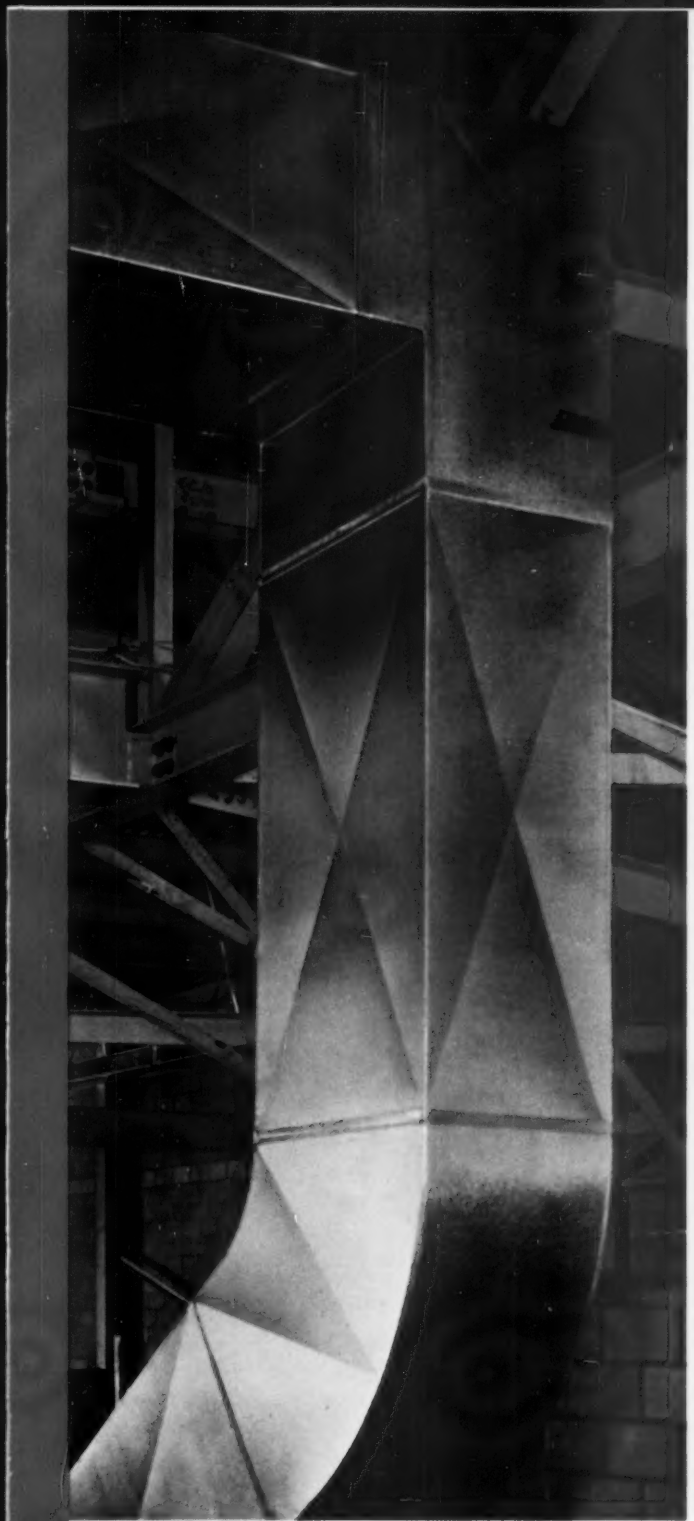

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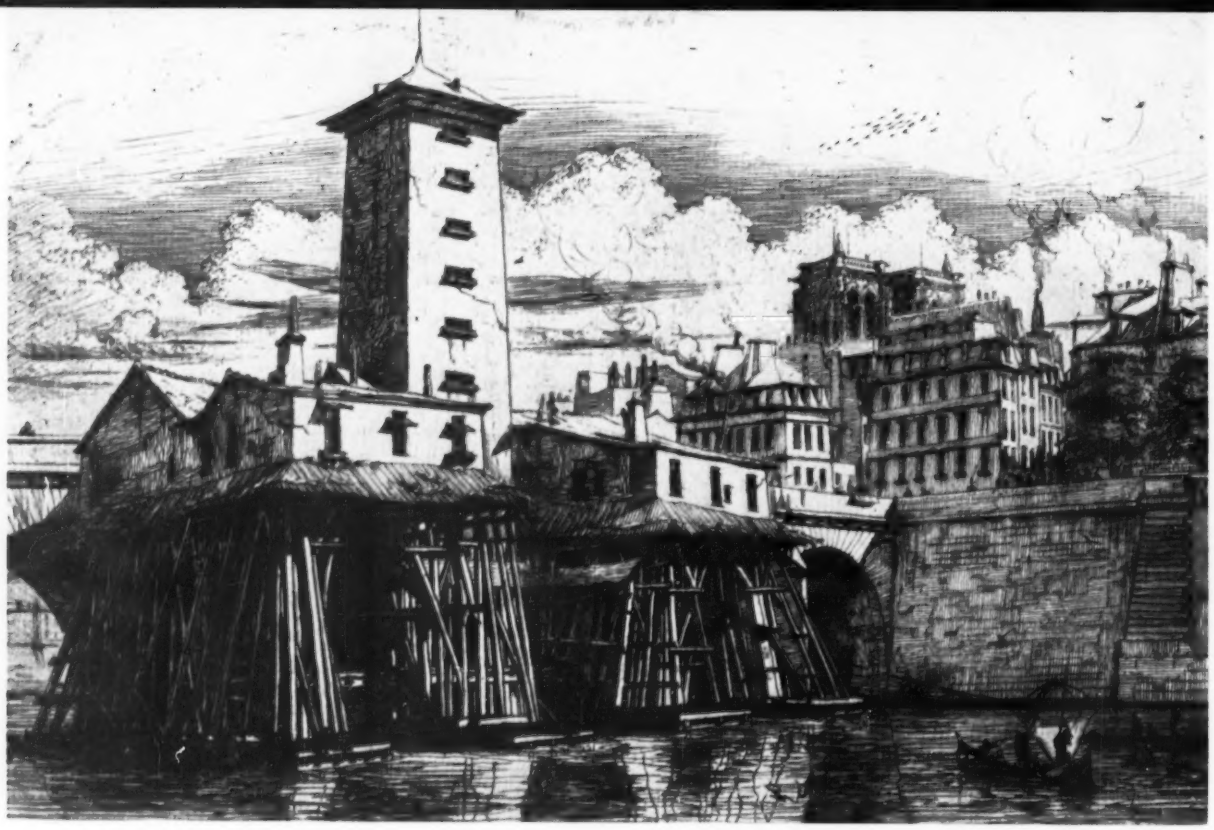


The famous water wheel pump of the Pont Notre Dame, built in 1670. (Etching courtesy of the Metropolitan Museum of Art.)

Belidor's *Architecture Hydraulique*

JAMES KIP FINCH, Dean Emeritus
Renwick Professor of Civil Engineering
Columbia University

OBSERVING that his principal interest was endeavoring to make his work worthy of public approval, Belidor issued the second volume of his great work in 1739. Volume II of *Architecture Hydraulique* was concerned with pumps. The first section states the "Theory of Pumps, the manner of their movement, & the description of many beautiful machines for lifting water." The second section includes notes on the "Manner of conducting and distributing water . . . and of holding it in reservoirs and basins."

In his preface to this volume Belidor notes: "Since I have had to postpone for over a year the time at which I had promised this second Volume, it is proper that I account for this delay. Messieurs the Provost of Merchants (i.e., the Mayor) & the Aldermen of the City of Paris, having asked that I make a report on the defects of the machine applied to the Bridge of Notre-Dame, which furnishes the water of the river Seine to a great number of public fountains, gave me

the honor of writing me in 1737, to communicate to them my views on means of correcting this machine, and of making it capable of the greatest production. Since in working on this project, which we have completed, I have arrived at many new discoveries on the movement of water & the improvement of machines proper to lift it, I have thought it wise to delay the printing of this second Volume to insert this, & at the same time to correct many essential details, founded on some principles of Hydraulics, previously stated, of which I have perceived the error.

The Properties of Air

"Until the Philosophers who began to undertake to explain the effects of nature about the middle of the last century," he records, "there was attributed to nature's abhorance of a vacuum that which is none other than the result of the weight of air." Galileo, he states, was the first to perceive that suction pumps could not lift water over 31 or 32 feet. Belidor also refers to the work of Toricelli and Pascal and to the mercury barometer as a means of measuring the weight of air. The inverse relationship of volume and pressure is stated and the effects of heat and humidity noted in his summary of an area of physics which early had attracted special attention. It is when he turns to dynamic problems, however, that limited knowledge and current scientific misunderstandings lead him into confused and often completely erroneous conclusions.

Piston Pumps

In opening Chapter III, Belidor remarks: "Pumps have become so necessary by reason of the services they provide, & the subject is at the same time so interesting, that we regard this chapter as one of those of this Work which merits the most attention." Both Chapters III and IV, a total of 150 pages, are devoted to piston type pumps, in the design of which he apparently felt he was expert. Three principal types are described: "suction pumps, force pumps, and those which at the same time suck & force." The cylinder is "commonly made of copper or of soft brass, the interior well-polished, since it is in this the piston moves, and it is desirable to diminish the friction as much as is possible." Together with the suction and outlet pipes, the cylinder was made of flanged joints with a leather washer, and secured by bolts. Apparently difficulties of casting limited pump diameters to 6 or 8 inches, and in the great plant at Marly, over 200 of these small pumps were used.

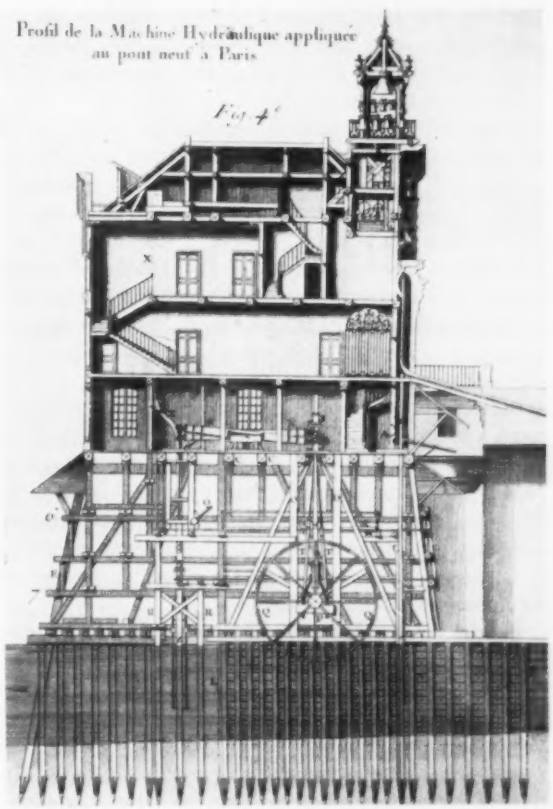
This adhesion cannot be perfect, he remarks, for it would cause too much friction. "Unfortunately, all the means we may give to the perfection of a machine do not offer us the promise of rendering it entirely exempt from faults . . . enough of them will occur without willingly inviting imperfection."

Belidor does not refer to pump slip, but, in a list of requirements on which "the perfection of pumps" depends, he discusses "the most advantageous construction of the pistons, so that their surface may have a perfect adhesion to that of the cylinder & neither air nor water can pass between them."

Another section deals with *soupapes*, or valves, the proper design of which Belidor fully recognizes as vitally important in avoiding losses in operation and wear on the machine. He describes four types: shell (disc) and conical forms with stems, and ball and flap valves. The ideal valve, he insists, should have an opening as large as the circle of the piston itself, but this is, of course, not possible when the valve is contained, as it often is, in the piston. The flap valve he feels "is certainly the least imperfect, in leaving a free passage to the waters."

La Samaritaine

Belidor's description of the notable pump installations of his time constitutes an interesting and valuable feature of his treatise. Paris, for example, was supplied river water from the Seine by two famous water-wheel pumps, the last of which was not removed until the



La Samaritaine, named for the statue of the Good Samaritan on the pump tower. It was built about 1608 by Lintlaer.

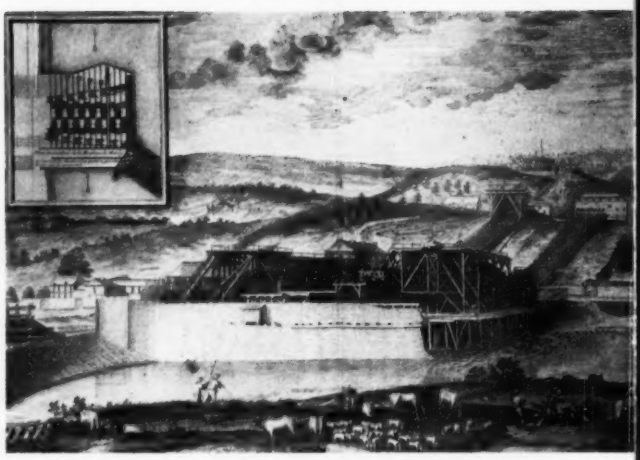
middle of the 19th century. The first of these, known as La Samaritaine because of the bronze statues decorating the elaborate edifice in which it was housed, belonged to the King and furnished water to the Gardens of the Tuilleries and the Palais Royal on the north bank of the river. Water-wheels in the second north archway of the Pont Neuf operated this famous machine, originally built about 1608 by an engineer from Flanders, Jean Lintlaer.

La Samaritaine, says Belidor, was "one of the most simple of its type" and he gives "plans, profiles, and elevations" and describes it in detail. Since the King wanted additional water for his gardens and fountains, and the people of Paris were inadequately supplied, Belidor analyzed the operation of this pump to suggest means of securing its "perfection."

Two timber pile cribs filled with stone confined the flow through the archway of the bridge to a narrower channel in which the undershot water wheel, 18-ft wide and 8-ft in radius "to the center of impression of the paddles," was placed. Cranks with 27-in. arms on each end of the heavy timber wheel shaft operated by connecting rods two overhead wood rocker or walking beams 20-ft long, the other ends of which were similarly connected to the pump pistons, 9-in. in diameter and with a stroke of 3-ft. Each of the four pumps had two cylinders of the combined suction and force type and was joined to a 6-in. outlet pipe which lifted the water some 72-ft to a storage tank in the top of the building.

Considering the water wheel Belidor notes that its speed was 2-ft 7-in. per second (at 2.8 rpm) or 3-ft 6-in. per second less than that of "the respective velocity of the current that strikes the paddles." Following his earlier ideas on impulse, Belidor holds that this corresponds to a velocity head of about 1/5 foot which would give a pressure of about 14 livres per square foot. Since the area of the paddle is 72 square feet he computes a total of 1056 pounds as "the impulse of the water which acts on the wheel." From this he subtracts the 557 which he computes as the effective work performed by the wheel. He concludes that the wheel has to provide some 500 pounds excess "to surmount the obstacles other than the weights," i.e., its frictional and other losses, and states: "This machine does not furnish anything near the quantity of water it is capable of producing." He proceeds to discuss its improvement in detail.

Belidor argues that this production could be surpassed by a complete redesign of the wheels and pumps. Thus: "This machine is not capable of the most great production, since the speed of the wheel should be one third that of the current, and it will not suffice to render it perfect by correcting the cylinders of the pump, leaving them the same diameter." The wheel he finds is also "susceptible of an important correction" in the number and size of its paddles. He further suggests that the size of the pumps be changed to correspond to the speed and impulse of the improved wheel and concludes that, after allowing for friction, a new machine properly designed could pump nearly twice as much water. There is no record, however, that this study by Belidor actually led to any changes in the pump.



The fantastic "Machine of Marly," built to provide water for the fountains of the King's Gardens at Versailles and Marly. 225 pumps lifted the water 525 ft above the Seine.

The Machine of Marly

"It cannot be said," remarks Belidor, "that anyone has ever built a machine which has made so much talk in the world as that of Marly; it should be added to the number of those extraordinary works which have been reserved to the magnificence of Louis the Great . . . It belonged only to this Monarch to cause a river like the Seine to give up its natural course, and to force it to carry itself to the summit of a mountain as elevated as this where it presently flows."

The famous "Machine at Marly," the mechanical marvel of the day, was built by one "Rannequin of the country of Liege, a man of excellent gifts for machines, who also had the daring to undertake to bring as abundant waters to Marly & to Versailles as if they were flowing at their source." Admired by all of Europe, it began to operate in 1682, says Belidor, and is said to have cost eight million livres.*

Fourteen water wheels, turned by the current of the Seine, operated the three sets of pumps which elevated the water to a masonry aqueduct at the top of the hill. At the river level 64 pumps lifted the water 150 feet through 5 soft brass pipes 8-in. in diameter

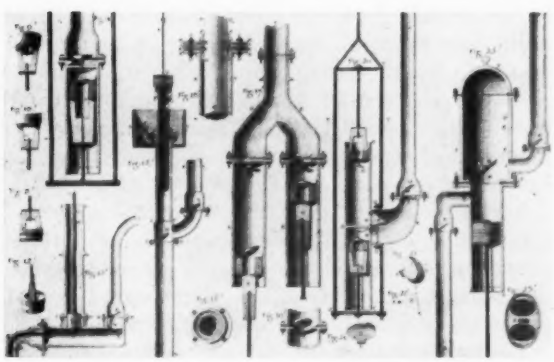
*As a monetary unit, the French *livre* was the value of a pound of silver. At current prices on the silver market, the machine cost nearly $87 million.

and 600-ft long, to a sump part way up the hillside. A second group of 79 carried it 1344 feet further to another sump, 175 feet above the first. Here the third set of 82 pumps lifted it 177 feet to the aqueduct, a total distance of 3684 (French) feet and 502 feet above the river. The Seine was held back by a low over-flow dam on the south side to force the flow through three timber passageways controlled with gates and in which the 14 water wheels were placed. A canal for navigation bypassed this installation. "There are about 60 workers," says Belidor, "who serve continually to operate this famous machine." It was finally replaced about 1803 by a steam pump.

Pump of Notre Dame

Belidor records that, in the earliest days, the people of Paris secured the water they needed from the river or from wells. Other water was later brought in small aqueducts from outside areas but, by 1670, "many quarters were at a loss for water, and it was resolved to increase the number of public fountains." The Mayor and Aldermen approved the construction of two pumps in the archways of the old bridge of Notre Dame, "the first by M. Joly, Ingenieur ordinaire du Roi, and the second by M. de Mans." These two machines, Belidor states, were constructed anew by Rannequin of Marly fame. In 1737, Belidor was called in, as previously noted, to report on further desirable changes and replacements.

Unlike the pumps of the Pont Neuf and Marly, which were operated by walking-beams, that of Notre Dame used cog wheels. Cogs on the water wheel turned a *lanterne* or pinion wheel at the bottom of a vertical shaft. Another cog at its top in turn rotated a horizontal shaft which was equipped with a multiple crank shaft to operate the piston pumps. The upper end of the vertical shaft was square and, passing freely through the center of the upper cog, this arrangement made it possible for the water wheel to be easily raised or lowered to adjust it to water level without disturbing the pumps.



Typical pump details as described by Belidor. The cylinders were made of soft brass, with the pistons of wood or copper.

Steam Pumps

In the latter years of the 18th Century, Watt's improvements in earlier pumps and his reciprocating engine made steam a widely useful form of power, but the idea of using steam dates back to the earlier years of the century. Belidor provides an interesting chapter on the first "Machines mues par l'action du Feu." Following some brief historical notes on early inventions he states that "the machine of M. Saveri is incomparably more perfect than that of M. Papin." Thomas Savery's pump, patented in 1698, consisted of two containers which operated alternately: steam was first condensed, sucking in water, then direct steam pressure forced the water to a higher level. Belidor mentions Newcomen "as having contributed much in bringing this machine to the perfection it has at present." Actually it was not Savery's but Newcomen's pump, a completely new device using a piston and cylinder, which Belidor illustrates and describes.

A machine of this type seen at Fresnes, a village near Conde, for pumping water from coal mines, is described by Belidor, who states it "worked day & night without ceasing . . . Two men suffice to govern in turn this machine which produces four times more effect than 50 horses driven by 20 men applied to an ordinary machine." Actually it was extremely wasteful of coal. Watt's later invention of the separate condenser made the steam pump more economical than those operated with man or horse power. It should also be noted that all earlier machines, and even those of Watt's day, were built in major part of wood. Metals were costly and employed sparingly.

The Delivery of Water

Volume II closes with a description of public fountains and the design of water jets for the decoration of gardens. Several aqueducts are described and an interesting illustration shows the famous aqueduct of Maintenon, begun by Vauban for Louis XIV but never completed. This was to have added water for the many fountain effects in the gardens at Versailles, a type of display which seems to have especially pleased Louis and the importance of which is reflected in Belidor's detailed discussion of the various forms of fountains then in use.

The two later volumes of Belidor's great text cover harbor and river constructions and add a number of interesting observations on locks and other works, yet his first two volumes, devoted to water wheels and pumps, undoubtedly constitute a major contribution to the rise of engineering science. Here is recorded a pioneer effort in applying technical and scientific understandings of the day to the design of the machines of a pre-steam era. ▲▲

STAFF REPORT

Survey of the Profession . . . 1961

Part III -- Where the Consultant Will Find New Work

Where the Work Will Be

CE exclusive

CONSULTING ENGINEER'S annual "Survey of the Profession" is designed primarily to obtain data for processing by IBM machines. However, some of the information contained in the replies to our questionnaires is nonobjective, and requires extensive answer-by-answer study to interpret. One question in the recent survey dealt with growth prospects for the profession. Consulting engineers approached this subject from three different angles:

¶ Projects – the types of projects that are expected to become more numerous

¶ Clients – the types of clients whose need for consultants will be expanding

¶ Places – the best geographical location for a firm that wants to grow

In order to be certain that the answers dealt solely with the private practice of engineering, only questionnaires from consulting firms were used – those from architect-engineer and engineer-constructor firms were not included. The largest single group of answers was from those who listed the type of project which offers the best potential in the next decade. Next most often mentioned was the type of client who will provide most of the work in the sixties. The smallest group indicated the section of the country, or part of the world, where they thought engineers would find the most work in years to come.

Projects

It would be impossible to list each type of project consulting engineers recommended as holding the best prospects for future growth. However, the answers could be broken down fairly well into five general fields: commercial construction; industrial construction and development; public construction; private utilities; and public utilities.

The smallest group of answers was in the private utility field. Most of those who saw this as the best area for growth already were engaged heavily in work for private utilities, and were speaking on the basis of their own experience. The majority of these replies mentioned small electric companies as the best single prospect.

A slightly larger percentage thought commercial construction offered the best opportunities for the consultant. Answers in this category generally agreed that large stores and shopping centers were the most promising projects for the coming years.

The public construction category included mention of such facilities as schools, hospitals, and civic buildings. A little more than one-fifth of the replies

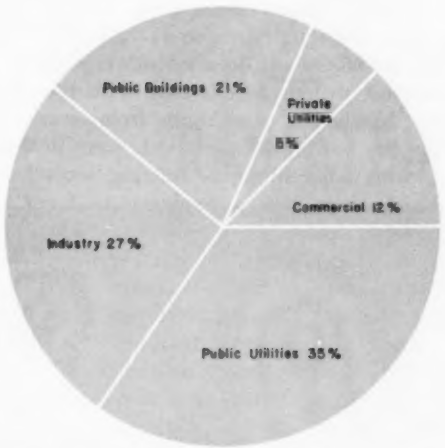


Fig. 1 — The expected distribution of work in the next ten years according to project type.

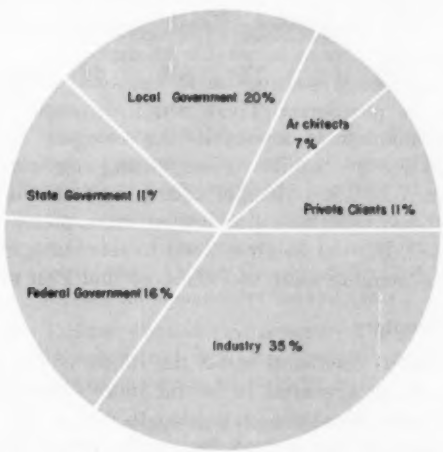


Fig. 2 — The expected work load in the next ten years, classified according to type of client.

suggested best growth prospects in this field; of these, more than half specified school construction. New hospital construction also was high on the list.

With those favoring industrial development and construction was included the small group who felt that the best chances for expansion were in the defense industry. Although the government plans to spend enormous sums of money on defense projects, only a few of the bigger firms expect to benefit from it directly. Also, there was a note of optimism — some of the replies hoped there would not be the need for extensive defense spending 10 years from now. Of industrial work in general, the most promising single items mentioned were modernization of existing facilities and advanced development of technical products.

The largest single field picked for opportunity was the public construction field, including highways and other government land development. Of this group, a clear-cut majority saw the best prospects for growth in water supply, sewage treatment and disposal, and air and water pollution control. Several consultants expected the Federal highway program to provide a great deal of work, but there was a general feeling that private consultants would have fared better under a Republican administration.

Among the comments in this group:

¶ "Growth in the public works field, if bureaucrats don't take over engineering."

¶ "Hospitals are reaching their age limit, so new construction must be contemplated."

¶ "Engineering has much to look forward to . . . backtracking a bit and applying fundamentals to the problems of new nations where the engineering know-how must be geared to the capabilities, facilities, and income of the less advanced nations."

Clients

Replies dealing with the type of client favored for expansion were relatively easy to analyze, since they

			Best Prospects For Growth in:					
			SE	S	W	NW	NE	Foreign
			16	23	22	13	11	15
Replies From:	SE	22	10	4	1	3	2	2
	S	17	2	10	3	1	0	1
	W	23	1	3	10	2	4	3
	NW	14	0	3	4	6	0	1
	NE	24	3	3	4	1	5	8

Fig. 3 — Geographical breakdown of job potential. The figures in chart indicate percentages of total number of answers.

were more clearly and definitely expressed. The answers can be tabulated in simple form, showing distinct categories.

Nearly half the respondents thought government work offered the most opportunity, and local or municipal government the best of the subdivisions. Not surprisingly, most of those favoring municipal government work were small firms; the Federal government was favored by the larger firms. The only point of confusion was in the matter of Federally financed urban renewal projects, where many do not seem to know for sure whether they are working for the local or the Federal government. Thus, there may be a slight misrepresentation in the subdivisions of government work, but the figures are fairly accurate.

About one-third of the replies favored private industry. The general trend of explanation here, when it was offered, was that the engineer's best chances lay in performing specialized work for industries that could not economically provide a full-time staff.

Smallest of the divisions in this group was the one favoring work for architects and other consultants. The explanation, as earlier parts of this survey have suggested, is that the firms preferring to deal with other professionals are the newer ones, which have not yet developed a long-term relationship with a group of private clients.

Considerably more numerous — and explicit — were the consultants who believed that the best growth potential was in work for private clients. Most of this group indicated that they expected best prospects in private construction: hotels, churches, large homes. Many in this group also took time to elaborate on their aversion to working for architects, and all suggested that the engineer should get his own projects, instead of subcontracting for other professionals.

Among the comments in this group:

¶ "Best prospects are in the public works."

¶ "If we become more socialized, the best prospects will be in government projects."

There was great divergence of opinion in the matter of work from the Federal government. Some consultants felt that increased government spending eventually would mean work for the profession; others expected increased spending would be accompanied by larger government staffs, depriving consultants of what work they now get. The over-all sentiment was perhaps best expressed by the engineer who said: "The best growth prospects are in government work, *unfortunately*."

Places

To break down the data on geographic replies, the country was divided into five arbitrary districts. As might be expected, the areas singled out for best growth potential matched with the home office locations of the engineers who chose those areas. The map shows the rough division of the country used for location of offices and location of projects.

The most striking fact is that, with the exception of the Northeast, consultants from every district thought the best growth prospects were in their own areas, with adjacent areas running second. In the Northeast, there was a tendency to favor foreign work; this is apparently because these firms are generally the larger and older ones — they are better prepared to take on major foreign projects. Further, there is the fact that the Northeast generally rated low among all engineers, because it is already so highly developed. It is not that engineers see no work in the Northeast, rather, that they see more work in other districts.

One factor in the replies that may be indicative of consultants' awareness of population trends: answers indicating the South, the Northeast, and the Northwest were scattered and vague; but answers indicating the West or the Southeast usually specified Southern California or Florida. Of course, this also may be a subconscious reflection of the consultant's desire for a more hospitable climate.

Two factors bearing on this section of the study must be mentioned. There was a disproportionately large number of replies in this category from the South and the Southeast; and, among engineers, there seems to be a hazy idea of what constitutes the South. Northeast, Northwest, and West were pretty clearly defined, but the South seemed to refer to a vast district — roughly south of Pittsburgh and East of Reno.

Commentary

In general comments about the future of the profession, there appeared to be far more optimists than pessimists. However, it is hard to give a fair representation of the outlook by quoting from the questionnaires, because the pessimists were more voluble and explicit than the optimists. A large number of the replies included bare comments such as: "Things are great all over." "There's work everywhere." And "Work is where you find it."

Some of the more detailed commentaries:

¶ "A stronger emphasis on ethics in engineering competition would be in order."

¶ "I see an important need for upgrading the fee schedule for service to architects."

¶ "The whole matter confuses me; I find I make more money and am happier when operating as a one-man firm. Perhaps consultants could grow if more executive-type engineers entered the consulting field."

¶ "The rules of ethics should be relaxed to permit soliciting of business."

¶ "I don't know where the prospects are. I've never been able to get a job that didn't come into the office by itself." ▲▲

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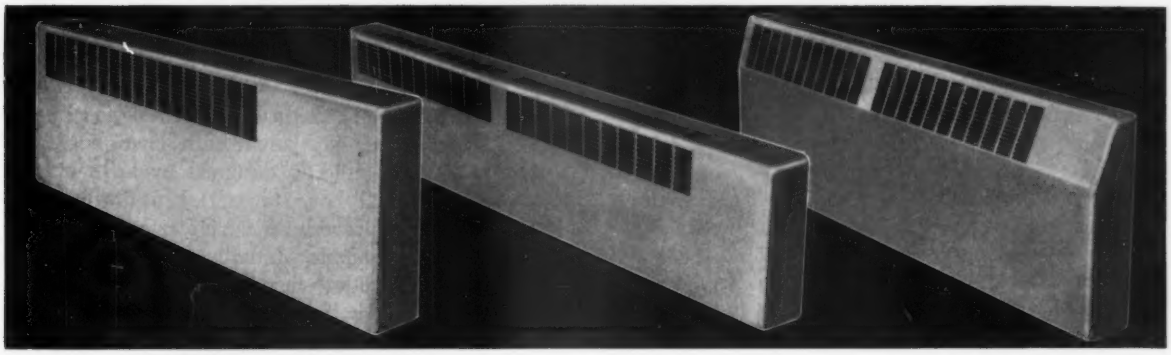

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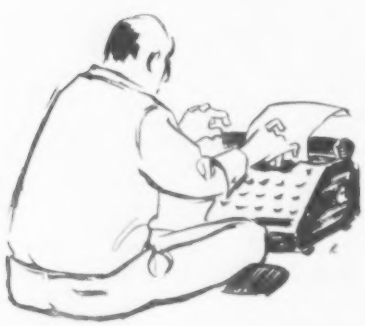


CE exclusive

IT HAS BEEN SAID that a building designed by an architect might fall down but that a building designed by an engineer will have to be taken down. This might be a good proverb on which to base the text of the following ramble. Actually, it contains some pretty good half truths, when you think about it, and perhaps, after all, half a truth is better than none.

At this stage of the game – after about 19 years practice on my own – I guess I realize that engineers don't differ too much from doctors, lawyers, people in general, yea, even architects. There probably are only a few really good ones at the top, a raft in the middle, and perhaps somewhat more than a few at the bottom – a fairly human pattern.

In this co-operative rat-race between the architect and the engineer I have observed these facts. However, there are some interesting differences between architects and engineers. Take their desks for instance: The architect usually has a scrambled mess lying on top of his, while the engineer usually has a glass top without even a grain of dust thereon.

Now the engineer is lucky, for he has an instrument which, when pressed into service like the electronic brain, can produce immediate and accurate answers. It is amazing how the engineer manipulates his slide rule and how he can hide behind it. Ask him a question which he doesn't understand and immediately the slide rule is whipped out while the client or architect waits with baited breath for the answer – which he never thinks of questioning. The architect also can use a slide rule, but he usually checks himself by long hand.

Now, strange as it may seem, I always liked the engineer who could look you in the eye without fiddling with his stick. He is the kind of fellow who admits that the answers might really come from a process of thought.

Incidentally, there are the engineers who have done it so long in one way that they find it dreadfully upsetting to delve into new methods and materials.

I have always wanted to find a coat of arms with a good Latin motto for an engineering society. It could perhaps be a lion and a unicorn and the inscription, in Latin of course, might read "It Cannot Be Done." I once argued with a mechanical engineer

the Design Professions

about a new idea for air conditioning an office building. For two weeks he said, "It cannot be done." When I asked why, he replied, "It wouldn't look well." I told him not to worry about it, since that was my department. When he finally saw that I had solved the problem to his aesthetic satisfaction, he produced the mechanical solution and saved the owner 35% on a $1 million air conditioning contract.

I suppose that we're all human in finding the grass greener over on our neighbor's lawn. Inherent in this human frailty lies the danger of trespassing.

I once designed an industrial plant here in New York with what I thought was a good engineering solution (Bob Moses said it was the ugliest building in New York), just because I was sick of architectural solutions. Well, I have a partner who is an excellent engineer – he used to teach it at Michigan – and he would like to design a hydroelectric plant to look like the Parthenon. This just proves that architects and engineers, as human beings, are only about par for the course.

If I were to put myself in the engineer's boots – that is, the consulting engineer who has to work with architects for a living – I think it would drive me crazy. Why? Simply because architects in general are screwballs – or maybe were screwballs.

Now this is in the way of a ramble in another direction. To be a good architect you must be a good screwball, not a bad one. This period, architecturally speaking, might be called "The Age of the Cliche." You just don't get free thinking, free wheeling architects in a period such as this. This is the age of the conforming or glamour boy genius, and what is even more ludicrous, the age of the disciple. Believe it or not, there are a couple of disciples running loose who are outsmarting and outshining their masters – so it's gone just about full circle.

Now there are cliche boys who care and there are cliche boys who don't care, and this is important – today it is the difference between the good architect and the bad architect. The good ones are simply the rage – the museums and the architectural publications publish their work to the exclusion of all others. Even the models of their buildings are exhibited long before the buildings are built. This has produced a fashionable set of architects – which is very good for them, because they are kept quite busy. You see I'm quite jealous, and naturally so. I'm sore as the dickens that I haven't developed a good cliche myself or inherited one from a master.

Another wonderful thing about the good cliche architect is that he doesn't care about money. In fact, the more expensive his building, the more he is sought after. This, I guess, is a good thing, because it keeps money circulating – at least during construction.

Apropos of this, one of our masters has said that "Less is More." This, indeed, is a philosophical statement and requires much deep thought. I once asked his chief disciple if it might mean less building for more money and he didn't think it was a bit funny!

The good thing about the good cliche architect, as far as the consulting engineer is concerned, is that the latter will make more money since his buildings won't vary too much. This, in an age of crass commercialism, enables the engineer to enjoy more of the good, and expensive, things of life.

Finally, there is a breed known as the Architect-Engineer, the Æ. I have a close friend, and Æ who is not only very successful in his own practice, but heads up the most illustrious engineering society in this country. Now he is exceptional. He has survived this form of schizophrenia only because he spends his weekends in the great outdoors, clobbering pheasants and ducks. He is a charter member of a club to which a few of us (one architect, one Æ, one mechanical, and one civil) belong. It is known as "The Fall Back and Fire Club."

By killing these things on weekends my friend relieves himself of tensions that would normally evolve into a suicidal urge. Even this unusual person is developing the habit of talking back to himself. If for no reason but to prevent that, his type of practice should be discouraged.

From the consulting engineer's point of view, I guess architects are like women – difficult to get along with, difficult to get along without.

From the architect's point of view, gone are the good old days of the Master Builder – when a Stone was a Stone for all of that. Let's face it – our lives are complicated by beams and girders, pipes and ducts, and to compound the felony, by structurals, mechanicals, and electricals- ▲▲

Westinghouse delivers dependable power to first automated U.S. Post Office

(Below) Functional, clean lines of the Providence Post Office exterior are highlighted by Westinghouse OV-25 parking area luminaires, assuring 24-hour maximum security operation. The luminaires' horizontal housing and tilted optical system are completely sealed against dirt, moisture and bugs for years of low maintenance, high efficiency operation.

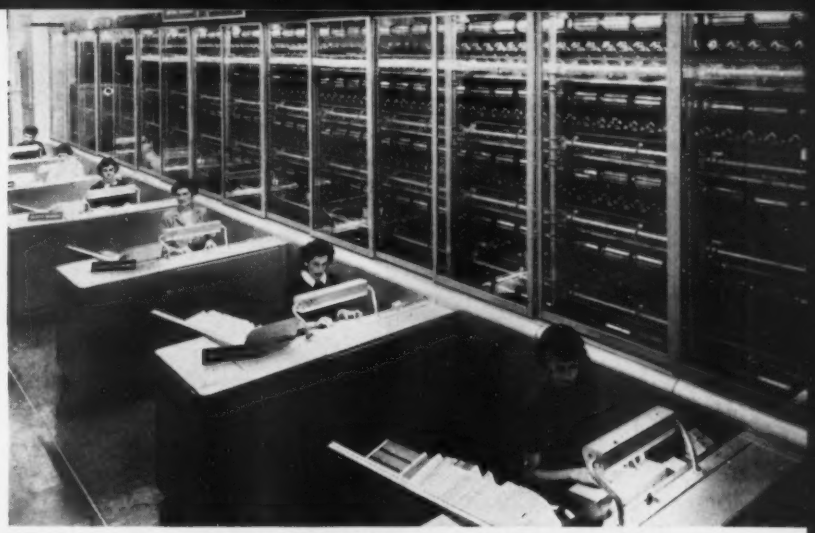
J-94161-1

The nation's first automated post office, labeled "Project Turnkey," is operating now in Providence, R.I. It represents the first step in the government's plan to make the complexity of mail handling completely automatic to insure 24-hour delivery of mail to any part of the country.

Behind the architectural beauty of this $20,000,000 facility is a vital electrical nervous system. And it's the sure, steady performance of Westinghouse electrical apparatus that keeps this marvel humming.

From dependable, maintenance-free outdoor luminaires that light the 14-acre site to 69 power and lighting panelboards that feed sensitive letter sorters, facing and cancelling machines, parcel post machine and conveyor system, Westinghouse products coordinate for the high degree

(*continued on next page*)



These 11 sorters distribute mail to bins for 300 separate destinations after an operator's key punch code has sent an impulse to the memory unit of the sorter. Other major machines in the system are six letter cullers, six facer-cancellers, two parcel post sorters, and over three miles of conveyors.

Owner: Intelex Systems, Inc. Architect-Engineers: Charles A. Maguire and Associates, Providence, R.I. General Contractor: Gilbane Building Company, Providence, R.I. Electrical Contractor: Brady Electrical Company, East Providence, R.I. Westinghouse Distributor: WESCO, Providence, R.I.

(continued from preceding pages)

of service so important to this "Post Office of Tomorrow." It is estimated that 10,250,000 kilowatt hours of electrical energy will be required annually for the 24-hour operation of the plant.

The Gilbane Building Company, Providence, erected the structure for Intelex, a subsidiary of International Telephone & Telegraph, who will lease it and its mechanized mail processing equipment to the government for 20 years. Design was by Charles A. Maguire and Associates, Providence. Westinghouse personnel worked closely with the consulting engineer from design stages through completion. Experience and the completeness of the Westinghouse line earned this working role in mail handling history.

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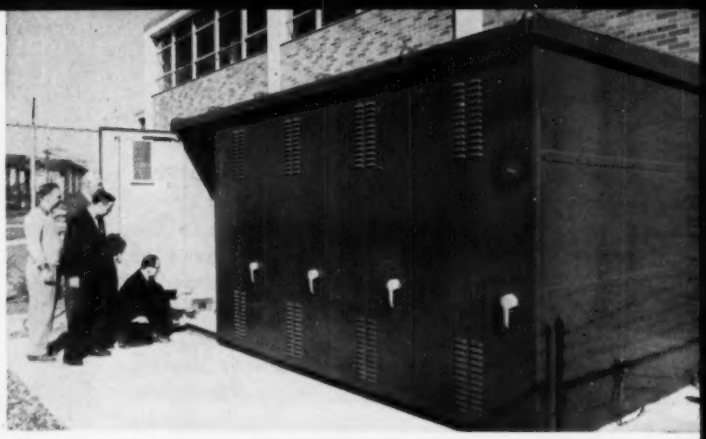
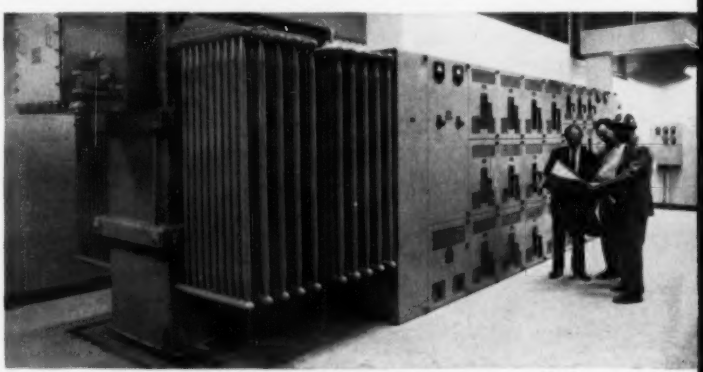
(Below) Reviewing drawings during the construction of Project Turnkey are, left to right: Arthur A. Watson, General Foreman, Brady Electrical Co., Inc.; A. I. Israel, Charles A. Maguire and Associates; E. Howard Rohrbach, Project Manager, Intelex Systems; Richard F. Martin, Project Manager, Gilbane Building Company; R. W. MacArthur, Westinghouse; and Walter W. Botts, Manager WESCO, Providence.



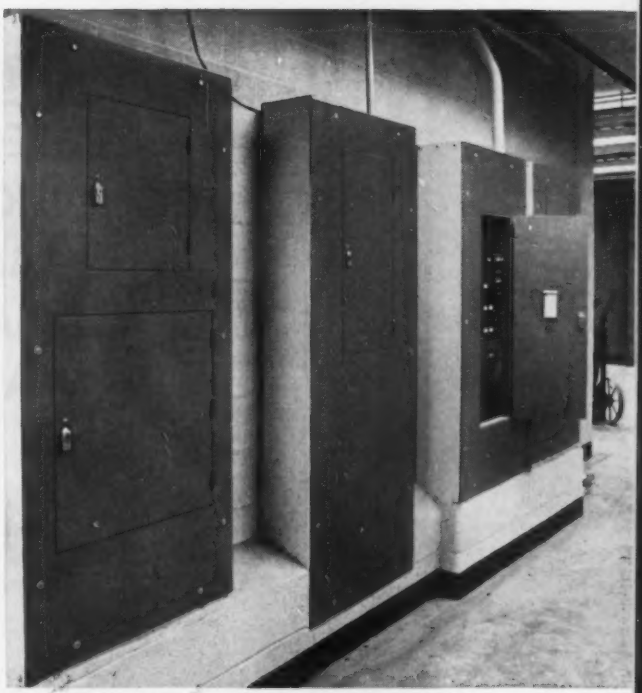
(Above) Rugged, weatherproof enclosure shields Westinghouse 150-DH-250 air circuit breakers which protect main feeders providing power to the post office. Inspecting breakers are A. A. Watson, W. W. Botts, R. W. MacArthur, and A. I. Israel (kneeling).



This main substation, rated 2500 kva, provides reliable source for lighting and power circuits. It receives incoming power at 11 kv directly from outdoor metal clad switchgear. Discussing schematic drawings of power circuits are: A. I. Israel, A. A. Watson and R. McCloskey, Resident Engineer, Charles A. Maguire and Associates.

(Above) A. I. Israel operates remote circuit breaker control panel for 15 kv outdoor metal clad switchgear as R. W. MacArthur looks on. Switchgear furnishes incoming power safely and efficiently to Westinghouse 500 kva power center serving post office auxiliaries. Compact design permitted location in minimum space, freeing valuable footage for work areas.

A. I. Israel, left, and W. W. Botts discuss operation of electrical system in mechanical building. In foreground is a 60 hp, 208 volt drip-proof Westinghouse motor, driving a chilled water pump. 400 amp safety switch on wall feeds an autotransformer reduced voltage starter which cushions inrush current to assure smooth pump start-up.



Westinghouse CDP power distribution panelboards equipped with De-ion® circuit breakers control and protect feeder circuits supplying power to intricate mail handling equipment. Complex systematized handling system requires reliable power supply since local failures would seriously impair movement schedules. Famed De-ion principle of arc quenching assures maximum circuit breaker life by preventing burning and pitting contacts.

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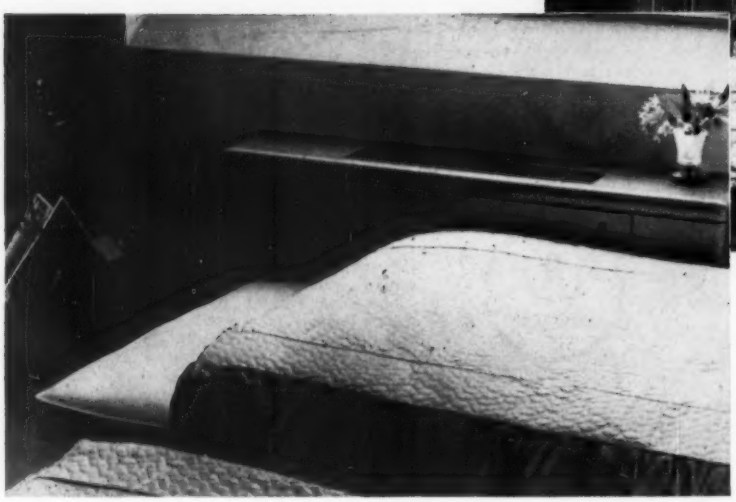

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MARJORIE ODEN,
Eastern Editor

With ARBA . . .

Engineering Division Meeting

Field Notes

THE 1961 ANNUAL meeting of the Engineering Division of the American Road Builders' Association, in Atlantic City, afforded the first open discussion of several pertinent issues currently before consulting engineers, including a summary of comparative cost findings between government and private engineering, accreditation, and the Coordinating Committee policy paper.

Cost Study

The study on engineering costs was begun by the Engineering Division in the early part of 1960. At that time, the General Accounting Office had published a report charging that excessive costs resulted from the use of consulting engineers (see "The Word from Washington," page 56). There was nothing to use as a comparison between government and private engineering costs to refute the charge. Also, the Blatnik Committee had started its investigations with considerable fanfare.

The consensus among ARBA members was that, since the organization covered all facets of highway design and construction, and the membership was broad, such a report should not be made public under ARBA auspices.

As Maj. Gen. Louis W. Prentiss, executive vice president of ARBA, explained it to the Engineering Division, "ARBA's greatest asset is that it is accepted as an objective organization working in the interest of the highway program as a whole. No particular segment of the highway field is favored over any other. We cannot have our cake and eat it too. We cannot get into trade association or professional activities and still speak for the entire highway industry. This does not mean we are not interested in your problems. It merely means we must consider and look at the broader picture."

Therefore, at the suggestion of the Engineering Division, a committee, representing the Division, CEC, AICE, ASCE, and NSPE, was formed to continue the study. Data gathered previously had all reference to ARBA deleted and the final report was presented to the Coordinating Committee.

The Committee Report

Maurice N. Quade, chairman of the original committee that gathered the cost data and new president of the Engineering Division, read two paragraphs from the report at the Atlantic City meeting:

"No discussion of this outstanding record of performance by private engineering firms would be

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complete without a mention of the availability and capability of the firms to perform this work in the very limited time available to do it under the extreme pressure and urgency to complete the work so that the projects could be opened to traffic and begin to earn and collect revenue. Interest costs on the larger projects amounted to more than $30,000 per day, and every day's delay, whether it occurred at the beginning, middle, or near the end of the project, was very costly. The engineer had to staff, equip, and complete the work under heavy pressure and on a fast schedule.

"Had this work been performed in accordance with customary procedures for the tax-financed highways, it is very probable that the period of design and construction for the toll roads financed by the revenue bonds—measured from the date of the sale of the bonds to the date that the project was opened to traffic — would have been at least one year longer for most of the projects. Experience shows that such an estimate is very conservative. One year's extension of time for all of the 19 projects would have meant an increase of at least $350 million in financing to capitalize interest for the added year. This is $75 million more than the total cost of the engineering, and it thus appears that the private engineering firms have more than saved the cost of their work. Projects which bordered on the limit of financial feasibility might not have been financed. In any case, the cost to the users of the toll roads has been significantly reduced by the efficiency of the engineering services performed by private firms."

Quade added that in states having cost data that could be computed on a percentage of total construction costs, average engineering costs were "significantly higher than the engineering costs on the toll roads previously given."

As an assignment for the coming year, the Division's engineering

High-Purity Water Made Possible with Nalcite Ion Exchange Resins

Dresden Boiling Water Reactor System has Unusual Demineralization Needs

Water purity in a degree not even considered a few years ago is required at the Dresden Plant of Commonwealth Edison Company in Northern Illinois. Nalcite Ion Exchange Resins have been chosen for the condensate high flow, reactor cleanup, and waste treatment demineralization units, one of which has an unusual system for removal, regeneration and re-placement of exchange resins.

Condensate High-Flow Demineralizer

2,800 gpm condensate, returning to the reactor from the turbine condensor, passes through the primary system demineralizer at flow rates of 70 gpm/sq. ft. of bed area. This demineralizer is designed to remove more than 1,000 lbs. of dissolved and suspended impurities from the condensate each year.

Resin Removed for Regeneration

To prevent cross-connections between the reactor and regeneration piping, equipment was developed for external regeneration of the ion exchange resins. This is accomplished by semi-fluid pressure transfer.

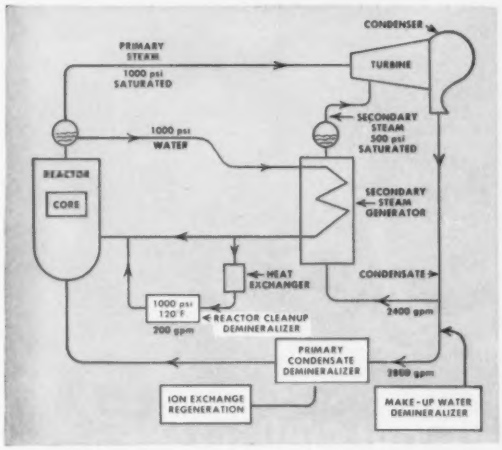
Nalcite HCR-W and SBR-P in the primary condensate demineralizer have the high degree of sphericity and ion exchange ability essential to high flow rate service at minimum pressure drop. They also have the resistance to attrition which permits resin transfer from the demineralizer to separate regeneration units and back, repeatedly . . . without measurable bead breakage.

Reactor Cleanup Demineralizer

The reactor cleanup demineralizer on the return side of the secondary steam generator system handles 200 gpm condensate at 1000 psi, 120° F. On-line and standby units have flow rates of 10 gpm/sq. ft. of bed area. Exhausted resins are radioactive, and are replaced with new resins, rather than regenerated.

Waste Treatment Demineralizer

Radioactivity in wastes is concentrated by the waste treatment demineralizer. Exhausted resins are radioactive and are sluiced from the units and prepared for disposal.



Simplified diagram of the Dresden Boiling Water Reactor steam condensate system. Nalcite resins are used in condensate high flow, reactor cleanup and waste treatment demineralizing units.

Make-Up Water Demineralized

Very small quantities of make-up water are required, due to painstaking design to eliminate condensor leakage, and other system losses. Conventional demineralizers, followed by mixed-bed polishers, provide make-up water.

Ideas for the Future

While operating temperatures and pressures at the Dresden Plant are nominal in modern steam generation practice, the special requirements for high flow and water purity from demineralizers in the steam-condensate system may have practical application outside nuclear reactor technology. It is significant that Nalco had ready, in Nalcite HCR-W and Nalcite SBR-P, ion exchangers which make possible these unusually severe ion exchange applications.

Ideas for Today

For busy engineers and technical men, Nalco has prepared concise data on water conditioning with Nalcite cation and anion ion exchange resins: Bulletins Z-12 and Z-13, free on request. If you want fast action on a specific water treating problem, Nalco experts are available on short notice. Call or write.

NALCO CHEMICAL COMPANY
Ion Exchange Division
6180 West 66th Place — Chicago 38, Illinois

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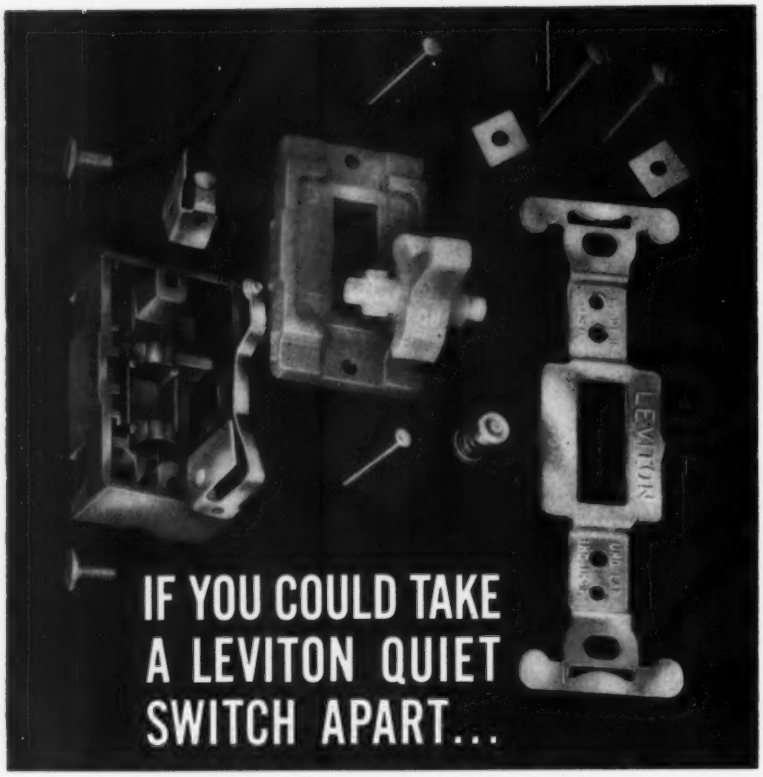

...you'd go a long way to being convinced that Leviton makes a specification grade device to last a lifetime. For example:

- The principal working part is a one-piece heavy phosphor bronze contactor that retains its elasticity through millions of cycles.
- The critical contact points are of special heavy silver alloy, selected for high conductivity and low oxidation to prevent arcing.
- Quality control during production makes certain of perfect alignment of contact points and smooth functioning of the switch.
- All parts are assembled in extra heavy molded phenolic—Leviton switches can take a beating!
- Finally—what you can't see—every completed switch is electrically tested before you get it.
- Available in single pole, double pole and 3-way . . . in either brown or ivory phenolic. Rating 15A 125-277V, AC only and 20A 125-277V AC only.

To be truly convinced of Leviton specification grade quality, install these wiring devices in your next project. Get complete data on the Leviton line by writing for Leviton's ABC handbook, that details specifications on over 600 Leviton devices.

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services committee will compile engineering costs on such projects as bridges, tunnels, and other highway projects, where the entire engineering has been done by private firms. This same committee also was asked to study the problem of increasing costs to consultants, decreasing construction costs, and static percentage fees.

Accreditation

The unfortunately labeled "accreditation" proposals also were discussed. As committee chairman Howard Corddry pointed out, for some reason the word "accreditation" gets a rather violent response from some engineers. "In my dictionary it merely means 'a presenting of credentials.' But some got so excited over the word that they would not give the proposals mature consideration."

Corddry's committee had studied measures which could be taken to police the profession, to eliminate any possibility of criticism on completed work. The suggestions were:

¶ Prequalification. The various engineering societies could establish a system allowing highway departments to prequalify the engineers they were selecting. This would mean the highway departments would require experience records, etc. The only material which would be updated when a consultant was being considered would be his current work load. This prequalification system would be general enough that it still would allow the highway department a wide margin in which to exercise its own judgment in choosing a firm.

¶ Accreditation. Under this proposed program, a board of accreditation would be created from members of engineering organizations. Accreditation ratings then would be given all firms requesting them. These ratings would remain unchanged until a reappraisal was needed due to growth of the firm, or other major changes.

Corddry said reactions to the proposals were widely varied —

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***joist-ol'o-gy, n.** (As Webster *should have* defined it) The art or science of designing and building more economical structures through the use of open web steel joists.

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Steel joists have been used in more school buildings than any other type of construction, because of low material cost and equally economical placing and handling costs experienced with these all-purpose structural members—light in weight but long in span and adaptability.

The continued specification of steel joists in school buildings will help make possible the completion of many critically needed school structures within the budget of the community.

The Steel Joist Institute has published several helpful technical manuals on the construction, performance and application of open web steel joists, including specifications and load tables, and an open web steel joist catalog. The Institute will be happy to send you this material, on request, at no charge.

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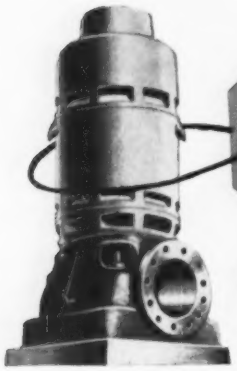

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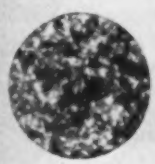
"Moly" iron has a more uniform grain structure, is far more corrosion-resistant than is the gray iron normally used in pump construction. Therefore, you get longer operating life, lower maintenance costs, when you specify Layne & Bowler "Verti-Line" Pumps!

COMPARE!

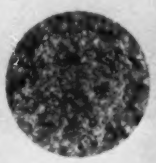
GREY IRON

MOLY IRON

▶ **These Photomicrographs,** both made at exactly the same enlargement (100x), show the structure of gray iron (left) vs. "Moly" iron (right). Note the long "stringers" of soft graphite characteristic of gray iron—stringers that weaken the metal and lead to early breakdown of the iron matrix. Note (right) how "Moly" iron is far more homogeneous, with uniform distribution of the iron matrix for longer pump life.



GREY IRON



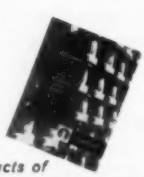
MOLY IRON

▶ **These "Fractures"** (views across fractured surfaces) clearly show the much coarser grain of gray iron (left) vs. the uniformly fine grain of "Moly" iron (right.) Although Layne & Bowler's fine-grained "Moly" iron assures much longer pump life than the gray iron used in other pumps, *you now pay nothing extra for this important "Verti-Line" advantage!*

Layne & Bowler has its own modern foundry—therefore can standardize its foundry runs to "Moly" iron techniques *at no extra cost to you.*

And if your operations are extra tough, "Verti-Line" pumps are available in special "Moly" irons having a Brinell as high as 350... a Tensile as high as 50,000 psi!

Remember—"Moly" iron is just one of many major pump advancements built into every "Verti-Line" pump—advancements that assure top performance for your pump dollar when you specify "Verti-Line" Pumps!



For more details on the many "Verti-Line" advantages, write for Bulletin #200.

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he cited an instance of two partners in a consulting firm giving very definite but opposite opinions.

"I am not taking a death stand on either of these proposals. I merely think they are worthy of consideration," Corddry added. His committee was told to investigate the feasibility of furnishing highway departments with the necessary tools to set up prequalification procedures. Also, the Coordinating Committee is considering a possible guide for the selection of consulting engineers.

As Corddry commented, cases of alleged incompetence result from a client failing to follow the correct procedures in selecting a consultant; from consultants being chosen for political reasons; or from low fees. "All of these discourage a competent consultant, and open the way for the incompetent who will lose his shirt on the project or do poor work."

Mason Lockwood, chairman of the Coordinating Committee group which framed the "Policy Paper on Engineering for Government" and new Engineering Division vice president, presented the policy to the division. It was adopted unanimously, but there was not time at the Atlantic City meeting for it to be submitted to the ARBA Board.

This policy, which, Lockwood explained, was not as strong as some consultants might like, was written to concur with the policies of large engineering organizations whose endorsement is sought.

So far, Consulting Engineers Council and the Engineering Division have endorsed the Policy Paper. It was scheduled for presentation to the American Society of Civil Engineers and the American Institute of Consulting Engineers in April. The National Society of Professional Engineers will consider the policy at a July meeting.

ARBA Policy

George Richardson, outgoing president of the Engineering Division, presented the new ARBA policy

a new and better way to

CLEAN AIR

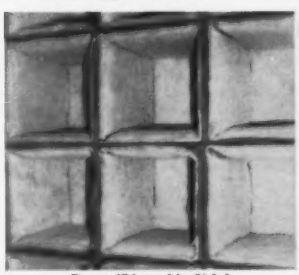
ULOK® Air Filters

Union Carbide research has produced the truly ideal strong, high-capacity filter medium with an irregular, highly-arresting cross section—DYNEL® modacrylic fiber! No other filter medium can touch it for stopping *and holding* unusually large quantities of dust and foreign matter. This dry, un-oiled filter can be vacuum cleaned several times to extend service life even further, if desired.

Proved in scores of major installations—in both new and modified systems—ULOK Air Filters are available in a variety of forms to suit any application.

The Remarkable ULOK Cube-Type Air Filter

Shaped like an open-top box with slightly tapered sides, the ULOK Cube-Type Air Filter with *five filtering surfaces* represents the most efficient filter shape yet perfected. In operation, air flow first carries the dirt particles to the back face of the filter. As dirt collects on the back face, and air resistance increases, air flow is shunted to the four sides, assuring uninterrupted filtration. In addition, the ULOK Cube-Type Air Filter provides far greater filtering surface than conventional filters with equivalent face dimensions . . . and the unique design of the wire basket-type retainers and batt edge assures a tight, leak-proof, press fit.



Front (Dirty Air Side) View of Typical Bank

Rear (Clean Air Side) View of Typical Bank

Advantages: • **Up to 600% longer service life over other throw-away filters due to higher dust-holding capacity** • **22% to 28% National Bureau of Standards atmospheric discoloration efficiency** • **Easier installation—filter is light in weight; no sharp edges or "splinters" to hurt hands** • **Lower labor and maintenance costs; lower inventories because fewer changes are required** • **Easier disposal—simply collapse and discard—leaving dirt *in the bag*** • **14 different sizes suitable for all new, and many existing installations** • **Only $7 to $13 per 1000 CFM of air covers total costs (except labor).**

ULOK Panel-Type Air Filters

Patented method of media formation provides a low-density, three-dimensional batt of high capacity DYNEL modacrylic fiber. Entire face and depth of filter traps dirt particles as inherent strength of medium permits elimination of face supports. Modern ring support provides sure-seal edge and eliminates problem of filter by-pass. Particularly suitable for slide-in applications, and all flat or V-bank installations not adaptable to the Cube-Type Filter. Available in 1″ and 2″ thicknesses, in 9 different sizes, from 10″ x 20″ to 24″ x 24″.

For special applications: ULOK filter media is also available in 2″ Pads, 58″ x 60″... in ½″ Rolls, 58″ x 25 yards . . . and in 1″ Rolls, 58″ x 15 yards.

For complete information on ULOK Air Filters, including efficiency and pressure-drop charts, write for new bulletins.

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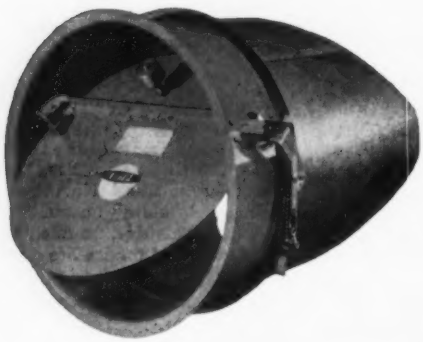

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statement relating to phases of the Federal-aid Highway Program. It reads, "The American Road Builders' Association believes:

¶ In the desirability of and need of state highway departments, adequately staffed with skilled professional engineers, free from political pressures, to meet the requirements of eligibility for Federal aid as presently established by the Secretary of Commerce.

¶ That private enterprise as represented by private engineering firms should be utilized in the planning, design, and construction engineering to the fullest practicable extent for the expeditious, efficient, and economical prosecution of the accelerated Federal-aid Highway Program.

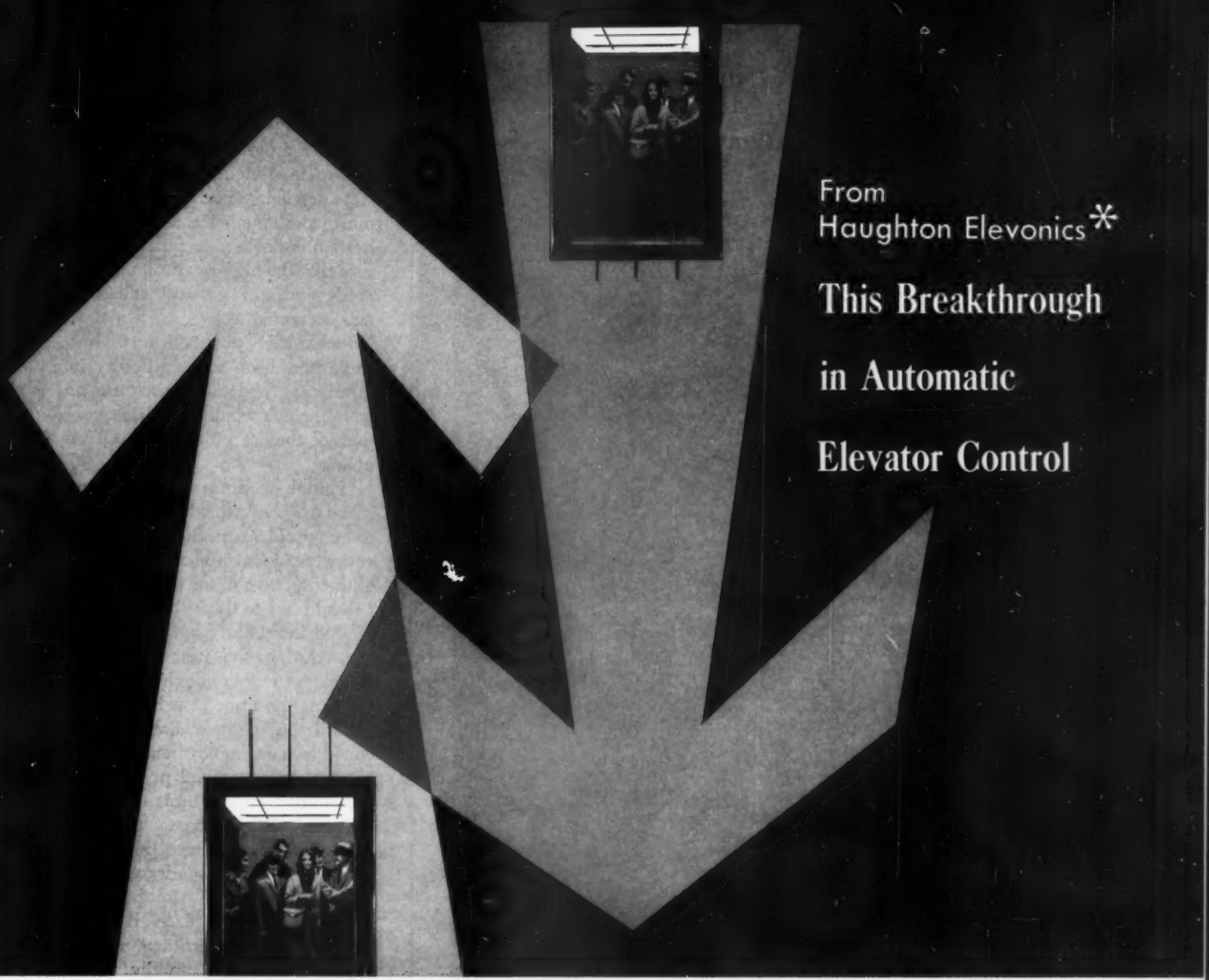
¶ That administrative regulations promulgated by the Bureau of Public Roads covering the use of private engineering firms are soundly conceived and give adequate authority for the employment of such private engineering firms.

¶ That state and Federal governments should pay adequate salaries for highway department employees and toward that need has been publishing annually the rates paid in every highway department for every engineering grade.

¶ In the need for full cooperation of all segments of the highway industry in the interest of advancing and improving techniques in highway engineering and construction.

¶ In full cooperation with every engineering group in the development of the highest possible professional standards among both public and private agency engineers.

¶ In the need for continuing cooperative efforts by the engineering division of ARBA with all other engineering organizations concerned with highway engineering leading toward a sounder understanding by public officials and the public in general of the most advantageous roles of the Bureau of Public Roads, state highway departments, and private firms in the accomplishment of all phases of



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Imagine floor-to-floor travel so smooth you can barely sense acceleration and deceleration . . . and faster than engineers thought possible a few years ago. It's a practical reality today, with Haughton Dynaflite . . . bold new concept of operatorless elevator control for new buildings and old.

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Dynaflite is but one result of the magic of Elevonics* . . . which, today, is shaping the new technology in vertical transportation. Get all the facts on Dynaflite, as well as Haughton's complete design, modernization and maintenance capabilities. The Haughton representative in your area will gladly consult with you—no obligation, of course. Or, write today.

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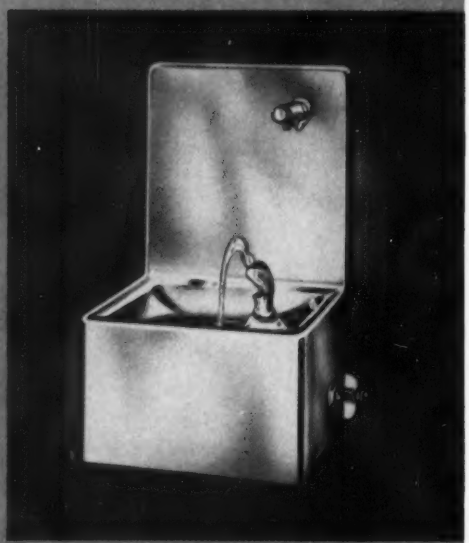

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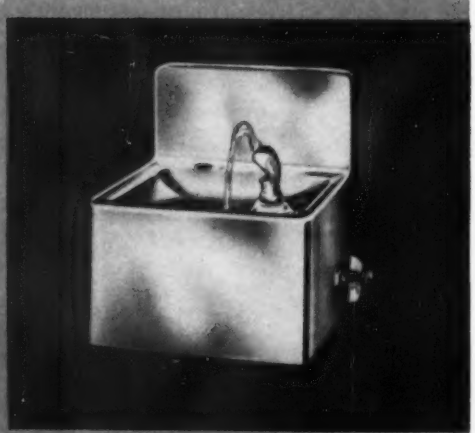

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engineering connected with the highway program.

¶ That the engineers of Federal, state agencies, and private firms must work together as a team in the best interests of the public to insure that the highway program proceeds with the greatest efficiency and economy."

Richardson pointed out that there had been some difficulty in developing a detailed program of action which would not raise questions of conflict with general ARBA policies.

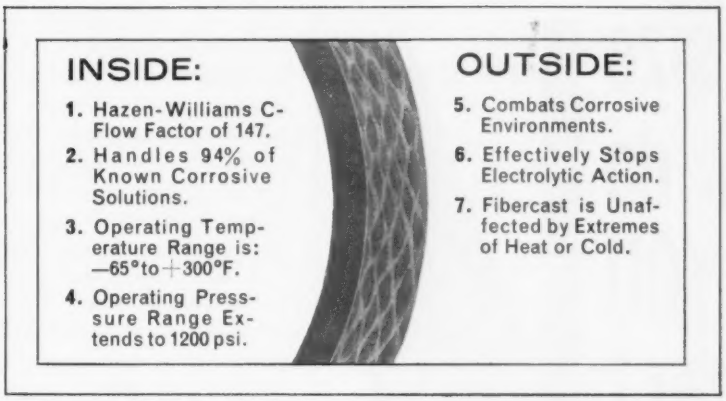
"I think, if we are honest about it, we shall have to admit that many of our problems in the field of private practice arise because of some of the practices of the private firms. I should like to think that these are limited in number, but my experience during the past few years leads me to other conclusions. Too many of the firms in private practice in the highway field are inclined to seek employment through political influence and pressures, rather than on the basis of qualifications and ability to perform. Too many firms have furnished services to highway departments which were not of the highest standards. I do not place all of the blame for these conditions on our own profession. Admittedly, it requires some courageous action at times to resist some of the pressures under which they operate.

". . . in our future work as I see it there will be certain things in which we can proceed on our own . . . working directly with the Association staff. In other activities our function might well be one of furnishing data and ideas for the Coordinating Committee."

The Blatnik Shadow

The shadow of the Blatnik Committee hung rather heavily over all of the ARBA sessions. Some of the more interesting comments:

A. E. Johnson, executive secretary, American Association of State Highway Officials, "We do not condone the acts of carelessness, im-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How Fibercast pipe is better built to combat corrosion...*inside and out!*

Years of research and development have perfected the most versatile pipe tested for heat, pressure and corrosive applications. Years of actual field use prove its long service life! Here are the reasons why:

1. FIBERCAST has a ceramic-smooth interior with a Hazen-Williams C Flow Factor of 147. Aids flow, resists deposit build-up.
2. FIBERCAST handles 94% of all known corrosive solutions. It is not impaired by acids, alkalies, salts, other damaging chemicals.
3. FIBERCAST withstands any temperature range from —65° to +300°F. This is a wider operating temperature range than any nonmetallic pipe.
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5. FIBERCAST has built-in inhibitors that combat the most highly corrosive environments and seals out contaminants.
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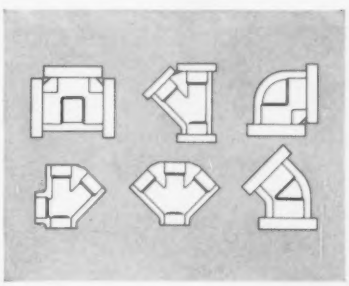
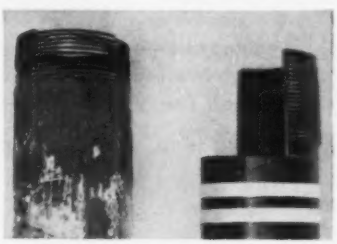


Fibercast has the world's most complete stock of standard fittings, as well as couplings designed and made to order for individual requirements.

The effectiveness and long-term durability of Fibercast pipe are the result of built-in inhibitors—high tensile glass fibers, imbedded and bonded by heat in epoxy resin, and centrifugal casting. It gives Fibercast a high degree of smoothness, ruggedness, permanence—and superior resistance to exposures involved in the most difficult corrosive, pressure and temperature conditions.

Reliability with true economy is built in—inside and out—and throughout the inner core of the casing thickness. This unique combination of benefits is not found in any other kind of pipe: rubber, glass, plastic, steel, stainless, aluminum, asbestos, brass or copper tubing.



Fibercast Tubing (right) used to suspend a 1,200 lb. pump for 3 years in a salt water supply well. *There was no loss in strength.* The damaged plastic-coated steel nipple (left) was used in the same installation, failed after 3 months' service.

Fibercast is available for all lines from 2″ tubing through 8″ pipe for service from—65° to +300°F. For more information mail coupon.

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which size stack do YOU prefer?

Each does the same job— the smaller one is equipped with a Lehigh Induced Draft Fan

Lehigh Induced Draft Fans are designed to help eliminate large, costly, unsightly stacks. They maintain a *constant* over-fire draft regardless of atmospheric conditions, help keep boilers operating at *maximum* efficiently at all times, and significantly *lower fuel bills* . . . while radically *reducing* the size of your stack.

Rugged Construction—long life: to prevent distortion under elevated temperature conditions, the fan housing, bearing pedestal, motor support and fan wheel of Lehigh Draft Induced Fans are constructed of all-welded integral ⅜" mild steel. A radiant heat cover and an aluminum heat flinger protect the inboard bearing from radiated heat. And because both bearing and shaft are kept to a low operating temperature, the Lehigh Induced Draft Fan makes use of standard, self-aligning ball bearing pillow blocks. *All* Lehigh Induced Draft Fans feature a flanged inlet, flanged outlet, and inspection cover as standard equipment.

If you would like to reduce stack height . . . and gain optimum boiler efficiency . . . contact your local Lehigh Representative today. He'll gladly give you all the details. Or write directly to us for our detailed technical bulletin:

2171
LF-1

LEHIGH FAN & BLOWER DIVISION
FULLER COMPANY, CATASAUQUA 4, PA.
Subsidiary of General American Transportation Corporation

TRADE LEHIGH MARK

propriety, dishonesty, incompetence, and inferior workmanship aired in the Blatnik Committee hearings, but we do hope that the public will view these disclosures in the proper perspective. The number of people and projects involved is extremely minute when compared against the large numbers of people taking part in the vast operation. There has been no disclosure to date indicating any premeditated organized attempt to defraud the public.

"There have been cases of carelessness, impropriety, and poor judgment on the part of a few individuals. In all cases, these transgressions were originally uncovered by the state authorities of the Bureau of Public Roads, with the Blatnik staff entering the case after disclosure and rounding out the investigation. The Blatnik Committee has done some constructive things for the program. Its by-products are yet to be evaluated, and they ultimately may outweigh the good that the Committee may have accomplished."

Rex Whitton, Federal Highway Administrator, "The troublesome problem is in the area of scandals and unwise procedures which have given all of us cause for concern. Actually, when considered in the light of the magnitude of the job, the irregularities have involved a very small number of public employees and a very small percentage of the public funds invested . . . A woman has just been sent to jail for stealing $2 million from a bank, but no thinking person wants to scrap the banking system on that account."

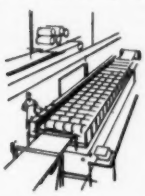
Whitton, who was making his first speech as Highway Administrator, also stated that "I foresee no drastic changes in the program as we know it. Whatever revisions are made are likely to be in the interests of speeding up the program, promoting greater efficiency in it, and humanizing certain aspects of it, rather than shifting emphasis or altering its basic goals." ▲▲

BUTLER BUILDINGS GIVE YOU

BAKER'S DOZEN VALUE

FOR YOUR BUILDING DOLLAR

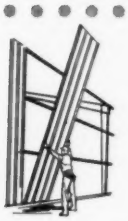
PRE-ENGINEERING. Designing a Butler building is simply a matter of selecting the correct, pre-engineered components. Routine engineering is eliminated . . . saving your engineers' and executives' time. Saving you money.



FACTORY FABRICATION. Automatic welding, shearing and gang punching are done to precise specifications—under rigid quality control. The result is a beautiful building . . . an end product that is better in every detail.

TENACIOUS FASTENERS. Experts agree, there is no such thing as a quality metal building *without* quality fasteners to keep it weathertight. That's why Butler uses costly, self-clinching rivets—machine driven to grip with 1,400 lbs. pressure.

INTEGRAL ALUMINUM SASH in all three wall systems. The smooth, satiny look of maintenance-free aluminum. The smooth fit of factory-fabricated components. There's no sloppy field-cut, field-installed flashing.



SPEEDY CONSTRUCTION. Erection is so simple, Butler buildings go up weeks, even months faster. You're in your new building sooner, doing business sooner. You save time and construction cost, without sacrificing quality.

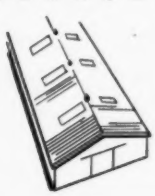
BUTLERIB® WALL PANEL. The finest single-ply wall covering made—so outstanding it is used in Butler's 20-year guaranteed roofs. It is factory color-finished outside and inside. It can be field insulated.

NEW TRIM. New gable and eave trim gives Butler buildings a crisp, finished look—beautiful contemporary lines. This new trim has a pleasing, two-tone finish that harmonizes with any color, any collateral material.

MORE OF YOUR WANTS, NEEDS, LIKES. There are 6 structural systems, 7 design loads, 4 bay lengths, 6 sidewall heights. You get the size building you want. And you get the type of building you want. No compromises.

BUTLER MONOPANL® A beautiful, three-ply, factory-finished, factory-insulated wall panel. Outside, bold, vertical fluting imparts strong shadow lines. Inside surface is smooth. No visible exterior fasteners. No caulking ever.

NEW BUTLER-TONE™ COLOR. Doubly desirable because it protects as it beautifies. Flat metal is galvanized, cleaned, then given a bonderizing treatment, then roll coated with a thermo setting plastic finish. 8 outside colors. Off-white inside.



TWENTY-YEAR ROOF GUARANTEE. You can have a preferred aluminum roof of such job tested superiority that Butler is now able to offer a 20-year guarantee. You're under no maintenance obligation. This guarantee is a Butler exclusive.

BUTLER MODULAR WALL. The ultimate in wall systems, yet the lowest-cost material in its field. A four-ply "sandwich" prefinished outside and in, factory insulated, too. Built-in doors and windows. Erection is simple and fast. The appearance—elegant.

FINANCING. Your Butler Builder will be glad to help you arrange financing. Ask him about the Butler Building finance plan.

Do you have any other questions? Phone your Butler Builder for the full story. He's listed in the Yellow Pages under "Buildings" or "Steel Buildings." Or write direct.

CELEBRATING 50 YEARS BUTLER FABRICATING METALS

BUTLER MANUFACTURING COMPANY

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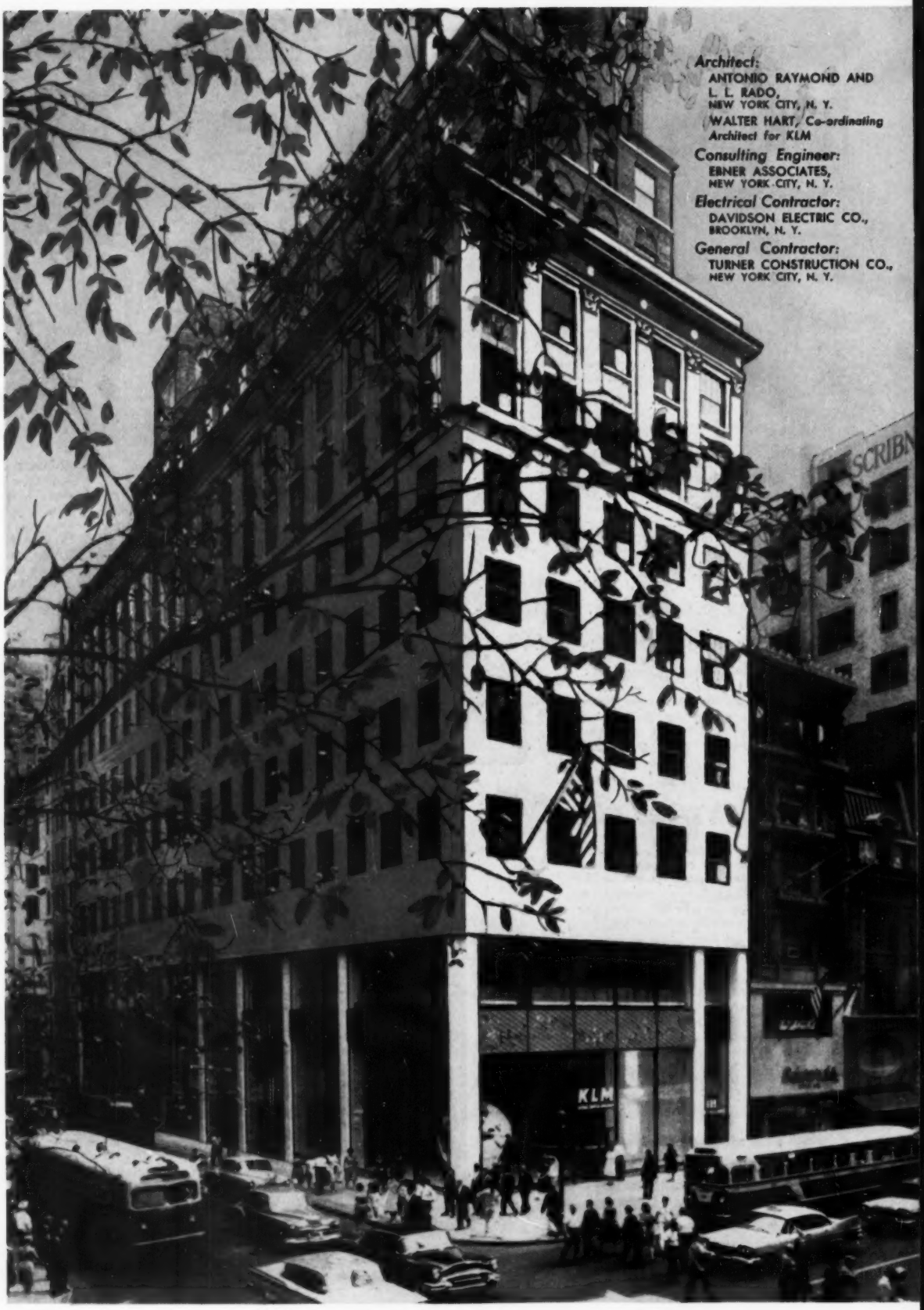
Manufacturers of Metal Buildings • Plastic Panels • Equipment for Farming, Transportation, Bulk Storage, Outdoor Advertising • Contract Manufacturing

Sales Offices in Los Angeles and Richmond, Calif. • Houston, Tex. • Birmingham, Ala. • Kansas City, Mo. • Minneapolis, Minn. • Chicago, Ill. Detroit, Mich. • Cleveland, Ohio • New York City and Syracuse, N. Y. • Washington, D. C. • Burlington, Ontario, Canada



Architect:
ANTONIO RAYMOND AND L. L. RADO,
NEW YORK CITY, N. Y.
WALTER HART, *Co-ordinating Architect for KLM*

Consulting Engineer:
EBNER ASSOCIATES,
NEW YORK CITY, N. Y.

Electrical Contractor:
DAVIDSON ELECTRIC CO.,
BROOKLYN, N. Y.

General Contractor:
TURNER CONSTRUCTION CO.,
NEW YORK CITY, N. Y.

Electrical Protection *is MODERNIZED* with BUSS fuses in the KLM Royal Dutch Airlines Building, New York City

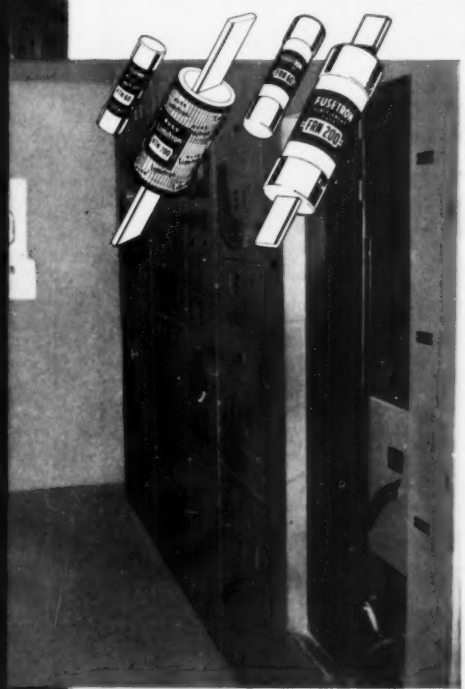
KLM INSTALLATION POINTS OUT THE NEED FOR SAFE INTERRUPTION OF HIGH FAULT CURRENTS

A 3 million dollar modernization program was recently completed on this 13 story office building at 609 Fifth Ave., which houses the American Executive and first floor ticket offices of KLM Royal Dutch Airlines.

To meet power requirements, the capacity of the electrical system was greatly increased, resulting in an estimated available fault current level approaching 100,000 amperes.

In the main switchboard, Buss LIMITRON fuses are installed to provide the high interrupting capacity necessitated by the available fault current and to give great current limitation needed to protect circuits and equipment.

To further assure safe protection and to safeguard against needless outages, distribution and feeder circuits are equipped with FUSETRON dual-element fuses.



Part of Main Switchboard Protected by:
3-3000 amp., 3-1200 amp., 6-1000 amp.,
BUSS LIMITRON FUSES and
15-400 amp., 3-350 amp., 3-275 amp.,
3-250 amp., 9-200 amp., 3-125 amp.,
3-90 amp.,
FUSETRON dual-element FUSES

Fuses Offer the Safest, Most Practical Solution to Modern Protection Requirements

As electrical network capacities increase, available fault currents of 75,000 to 100,000 amps and up are no longer uncommon.

In order to adequately safeguard circuits and equipment, it becomes imperative to install protective devices that can safely interrupt these fault currents.

HIGH INTERRUPTING CAPACITY

Fuses provide high interrupting capacity at a very low cost. Buss LIMITRON fuses have an interrupting rating of 200,000 amps. rms symmetrical — and for FUSETRON dual-element fuses it is 100,000 amps.

CURRENT LIMITATION

Buss LIMITRON fuses also provide current limitation so that fault currents are shut-off before equipment on the circuit can be damaged.

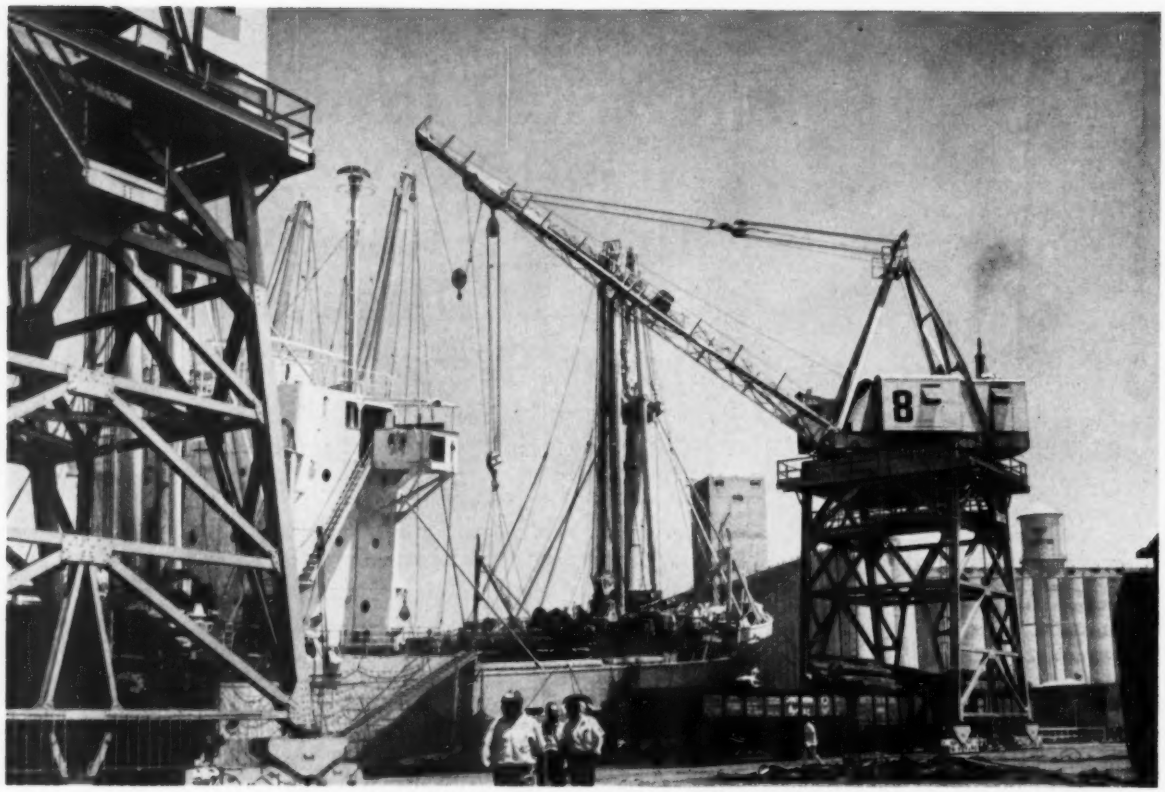
LIFE-TIME DEPENDABILITY

Fuses remain safe and accurate through the years. Fuses have no triggers, latches, pivots or contacts to stick or get out of order. They require no expensive maintenance or recalibration — they are always ready to function the instant trouble occurs.

To help you select the proper fuse, write for the new BUSS booklet . . .
BASIC PROTECTION FOR ELECTRICAL POWER SYSTEMS.

301

BUSSMANN MFG. DIVISION *McGraw-Edison Co.*
University at Jefferson, St. Louis 7, Mo.



Stockton's Twin Clyde Whirleys Handle Heavy Cargo with Ease and Speed!

TOP PHOTO: Unloading cargo from ship's hold to gondolas is fast, low-cost and safe with Clyde's advanced controls.

LOWER PHOTO: These two Clyde Whirleys at the Port of Stockton, Calif., can handle heavy cargo working either in tandem or singly.

Progressive ports everywhere that successfully compete for more tonnage, have turned to Clyde for the finest, most modern, heavy lift cranes available.

Clyde's reputation for day in, day out performance is based on the records of many money-saving installations at leading ports . . . from Hoboken to Stockton, from the Great Lakes to the Gulf . . . and other important domestic and foreign ports.

There are sound reasons why Clydes are favorites wherever modernization or expansion of shipping facilities are planned. Because every Clyde Whirley is tailor-made for the particular application, utmost efficiency and performance is always assured. In making cranes like these, experience counts . . . Clyde has it . . . over 60 years of specialization in the design and manufacture of material handling equipment.

For faster, more economical and safer cargo handling, check the advantages of Clyde Whirleys. Write for Bulletin 12.

"You'll Take Pride In Your Clyde"

CLYDE IRON WORKS, Inc.

Established 1899

DULUTH 1, MINNESOTA

A SUBSIDIARY OF RIC

HOISTS : DERRICKS : WHIRLEYS : UNLOADERS
BUILDERS TOWERS : CAR PULLERS : ROLLERS

How the Plant Engineer Views the Consultant

Findings of an AIPE Survey

A SURVEY was conducted by the American Institute of Plant Engineers last year to determine what the average plant engineer thinks about the use of consultants for the design of manufacturing plants, warehouses, and special purpose buildings. The survey showed that plant engineers generally have a high opinion of consulting engineers, but there are complaints.

The most common complaint was that the consultant did not make full use of the plant engineer's ideas and experience. Almost one-third of those replying to the survey commented on this. Another common complaint, found in about one-fourth of the replies, was that the consultant tended to bypass the plant engineer and deal directly with higher management.

The major technical problems concerned heating and ventilating – particularly insufficient make-up air and inadequate ventilation. Consensus was that more careful supervision of construction would clear up many of the problems.

Comments on different problems in new plants were combined. Of course, those who were happy had no comments, so the following random samplings from the 58-page AIPE report do not mean that the complaints were widespread:

Heating and Ventilating

¶ " Did not allow sufficient make-up air."

¶ "Heating and ventilating unit is noisy, and it is installed in a quiet area of the building."

¶ "Heating equipment consists of approximately 28 direct fired oil heaters in penthouse enclosures on roof. Considerable time is expended in checking units daily during heating season and in cleaning and servicing during off season."

¶ "Heating was designed by three separate chief engineers. When reductions were called for, survey was not complete. Several thousands of dollars spent to rework."

¶ "Heating equipment was misplaced – unit heaters were not in desirable locations."

¶ "Required extensive adjustment for proper distribution of hot air."

Roofing

¶ "Roof is built up tar and gravel over insulation on metal deck. Leaks develop from various causes and are almost impossible to locate and repair."

¶ "Roof leaks, and the drain lines are not adequate."

¶ "Roof flashing leaked. Architect and builder passed buck to each other, so we had to take over and completely reflash the roof."

¶ "A continual problem to stop leakage in aluminum roofing."

¶ "Leaking roof caused blow-out of 800-amp entrance on line side of breaker . . . cut out 13,000 volts beyond transformer."

Walls

¶ "Cracking and breaking at junction of column and wall. Shrinkage apparently concentrated. Bad spalling at joint. Tilt-up."

¶ "Concrete walls cracked, allowing water to enter."

¶ "Conventional metal building walls cannot withstand punishment of industrial tractors used in ware-

weather-proof
everlasting
protected
lighting

82-84
square round

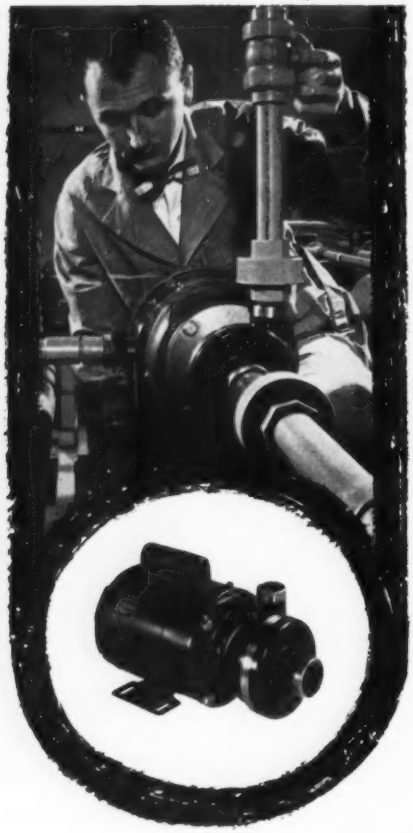
lines
by mc Philben

Exterior and interior ceiling surface applications under CANOPIES, MARQUES, in SHOWER ROOMS, CORRIDORS, VESTIBULES, ALL PURPOSE ROOMS, LOBBIES, SHOPPING CENTERS. Absolute security application in PSYCHIATRIC HOSPITALS, PRISON CELLS, CHILDREN SHELTERS.

82 and 84 lines feature:
• ALL CAST ALUMINUM, sturdy, 2 piece construction in both guarded and non guarded units with integral cast hinge. Extra heavy .156 inch wall thickness.
• VAPORTIGHT (enclosed and gasketed), BUGTIGHT, WEATHERPROOF performance.
• mcPhilben's EVERLASTING ANODIZED satin aluminum finish, for permanent protection against corrosive elements.
• CHOICE of diffusers: Holophane prismatic Controlens,® *tempered* Fresnel Lens, heavy molded Carrara glass, or Herculite (for high security applications)

Complete specification data sheets on request Section A pages 9-10, 9a-10a

mc Philben
LIGHTING
1329 Willoughby Ave Brooklyn 37 N Y



Each Chemtrol Pump is thoroughly tested before delivery and carries a full warranty.

PLASTIC PUMP DEFEATS CORROSION

Specifically engineered for the chemical processing industries, Chemtrol's molded Penton plastic pump has the broadest corrosion resistance spectrum of any centrifugal pump on the market today . . . a pump unmatched for corrosive conditions.

Now you are able to pump most acids, alkalies, salts and solvents . . . many at elevated temperature without change of pump parts.

Various sizes of enclosed-type or semi-open type impellers with optimum contour design . . . pressure balanced to give low thrust loads. And the positive mechanical seal, operating at near suction pressures, is cooled by the fluid being pumped.

Kraloy/Chemtrol pipe, fittings, valves and pumps assure corrosion-free, more efficient service with greater economy. If corrosion is a problem in your piping system investigate the advantages of plastic products designed and manufactured by

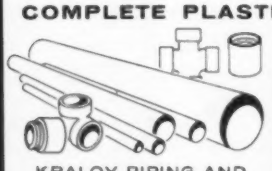
Kraloy/Chemtrol Co., 402 W. Central Ave., Santa Ana, Calif.

QUALITY PLASTIC PRODUCTS FOR INDUSTRY

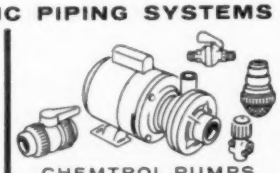
KRALOY/CHEMTROL CO.

SANTA ANA — PHILADELPHIA — DALLAS

COMPLETE PLASTIC PIPING SYSTEMS



KRALOY PIPING AND ELECTRICAL CONDUIT



CHEMTROL PUMPS, VALVES AND FITTINGS

house operations. Difficult to repair resultant holes, bent walls, etc."

¶ "Reinforced concrete for five feet below metal siding. Concrete not strong enough . . . has several holes knocked in it."

Windows

¶ "Building is a glass panel on three sides. Because of sun glare, covers had to be installed. Also, the glass leaks."

¶ "Corrosion of steel sash — now using aluminum."

¶ "Windows are a special explosion-venting type, and have shown water leakage under heavy, driving rain."

General Advice

¶ "Convince management to release project with sufficient lead time so that crash programs can be minimized, thus avoiding extras and misunderstandings."

¶ "Plan for more expansion than management wants."

¶ "Pick a good architect-engineer. Look at it as hiring an employee, because that is what it is."

¶ "Add about 50 percent more floor drain outlets than you think you will need, then double it."

¶ "Never design a new manufacturing facility without a little extra margin in the roof members. In these days of automation, overhead conveyors and monorails are sure to be required, and you can't hang them from bar joists."

¶ "Provide separate loop system for unit heater steam or water supply to permit servicing without shutting down equipment."

¶ "We get three bids from engineering companies on building shell . . . we do all engineering except shell. We hire contractors who work from our drawings on heating and ventilating, plumbing, electrical systems, lighting, pits, tunnels, machine design, etc. We have found that architects and engineers cut corners to justify their fees. We end up with something we do not want. We have some sad experience.

¶ "In specs, watch out for *or equal*. We had two that backfired." ▲▲

Compare Honeywell's latest air cleaner advances

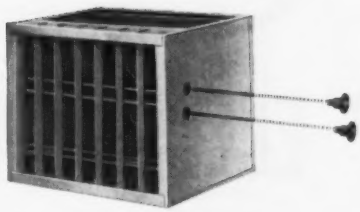
Exclusive Flutter-Jet* washing solves the problem of cleaning air cleaners

Honeywell's new Flutter-Jet washing system sweeps away collected dirt with a powerful stream of water. Its flexible rubber nozzle keeps water in larger droplets as it strikes the surface, assuring greater washing action. Attached to a moving manifold, it covers the entire area. It requires as little as 20 pounds of water pressure, and can't be clogged by salts or other impurities in the water. Flutter-Jet washing prevents breakdowns, reduces maintenance and increases efficiency.

Exclusive power safety system saves steps, assures maximum protection

A direct current sensitive relay in Honeywell's new power safety system makes it possible to control the power supply from a remote location. This permits the system to be reset without losing time going to the equipment itself. This new relay also enables you to hook the system up to a centrally-located alarm panel (see illustration), where an audible or visible alarm will be answered immediately. By providing a continuing check on equipment, it assures maximum protection and top operating efficiency at all times.

New intercell button connector cuts field installation time



Never before has it been so easy to make the electrical connections between cells. And this spring loaded ball and socket arrangement—less than 3 inches in diameter—is completely waterproof. Best of all, it features a plastic sealing ring of high dielectric strength that prevents loss from arcing as current flows between the cells. The new intercell button connector cuts installation time considerably and makes dismantling for service a snap.

New power pack features oversized selenium rectifiers for longer life

New oversized selenium rectifiers give this power pack greater dependability and a longer life. These solid-state rectifiers help stabilize the current output and maintain a constant peak inverse voltage. They are also mechanically shock resistant—a great advantage in shipping and handling. The power pack itself provides dual voltage for higher efficiency—90% at an air flow of 500 feet per minute.

Now you can specify the Honeywell Electronic Air Cleaner with even greater confidence. And only Honeywell gives you complete service back-up. Honeywell field engineers will supervise the installation, check out the equipment once it has been installed, and train the men who operate it. And an exclusive Honeywell maintenance contract assures your client maximum cleaning efficiency—through periodic inspections—for the life of the system. For details, call your nearby Honeywell office. Or write Honeywell, Dept. CO-5-111, Minneapolis 8, Minnesota.

*Trademark

Honeywell

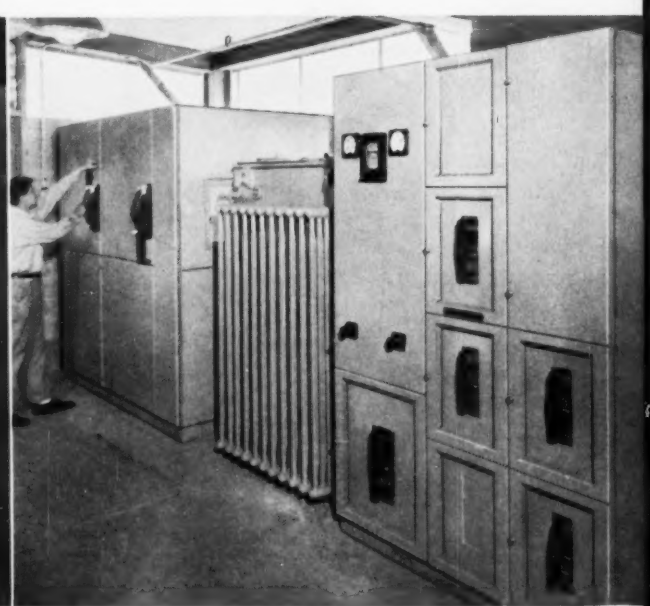
First in Control

SINCE 1885

HONEYWELL INTERNATIONAL
Sales and service offices in all principal cities of the world. Manufacturing in the United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

OPERATION COOPERATION IN ELECTRICAL SERVICES

Coordinated planning between consulting engineers, their clients and Allis-Chalmers is behind many of today's most efficient and modern electrical systems. Allis-Chalmers is proud of the part it plays in providing advanced equipment such as new whisper-quiet dry-type transformers . . . new space-saving high-voltage control centers . . . and many other products. Each demonstrates the extra value that is standard with A-C . . . the greater efficiency and the added productivity which your client enjoys when you specify A-C products, systems and services. Call your nearby A-C office for details or write Allis-Chalmers, Industries Group, Milwaukee 1, Wisconsin.

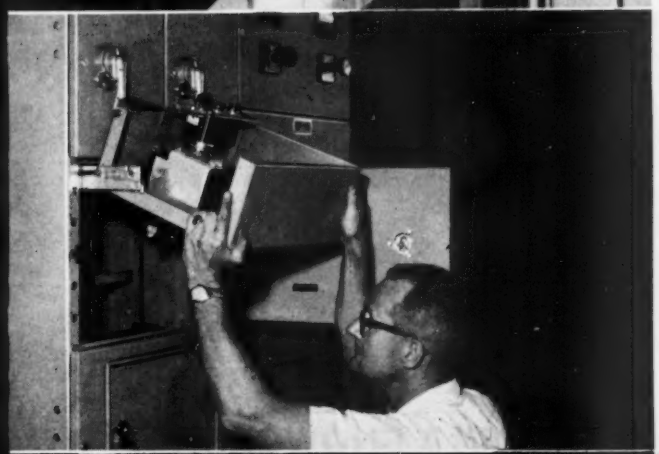


Lowest height, easiest access 5-kv metal-clad switchgear on the market. Just 72 inches high, you get eye-level instrumentation, shoulder-height accessibility of component parts. Other outstanding advantages: front-accessible current transformers; maximum compartmentation and dead-front construction for greater safety; full-panel metering; rapid, one-stroke breaker insertion. Choice of Allis-Chalmers stored energy or solenoid operated circuit breakers

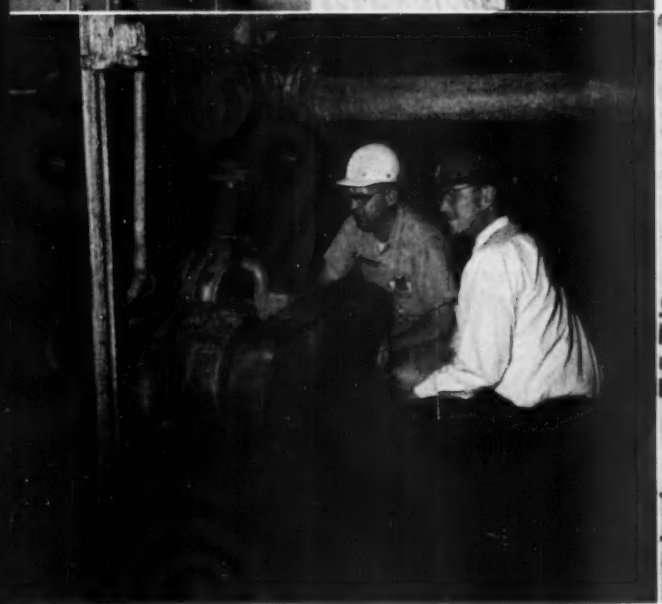
Here's proven accuracy in low-voltage switchgear with 3 independent elements available in a series trip device. You can get accurate settings with calibration scales below adjusting knobs on front of trip device. Minimum, maximum and intermediate time-delay band settings are field-adjustable for each pickup value for fine selectivity. Dead-front design with drawout interlock. Operator easily inserts and withdraws breaker. Simplified engineering reduces installation costs.

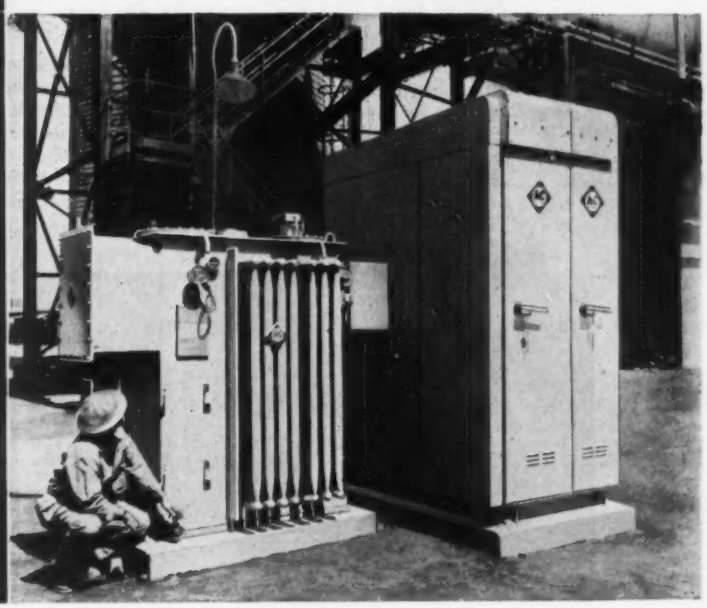
Curvacore, Super-Seal, Paxeal and Chloraxtol are Allis-Chalmers trademarks.

Cut installing time in half with new, whisper-quiet dry-type transformers! Now 35% smaller, lighter, this new design eliminates common installation problems. Unique 3-piece case makes handling, wiring go like clockwork. You'll install them in 40 minutes instead of the usual 90 minutes. Every known factor in subduing noise has been incorporated . . . and exclusive *Curvacore* construction lowers exciting current, core losses. Requires *no* special insulating cable for hookup.



Control centers cut costs . . . You save space, simplify wiring and reduce inspection and maintenance expenses with new A-C low-voltage motor control centers. Plug-in terminal blocks and draw-out construction cut inspection and maintenance time by making it quick and easy to withdraw or remove control units. Pushbuttons and pilot lights on removable frames eliminate failures common with hinged wiring. Special connectors make it impossible for bus connections to loosen.





Acid drips, but open motor's efficiency never drops: This *Super-Seal* open motor replaced a TEFC unit driving a pump in a vanadium and uranium extracting process. Though constantly subjected to drippage of a sulphuric acid and organic phosphate mixture, it keeps right on running. Its *Poxeal* insulation defies corrosives, moisture and contaminants. Open design gives a service factor of 1.15 . . . provides reserve capacity to meet sudden overloads.

Lower first cost is just one of many advantages of this packaged unit substation. Simplified engineering, planning and purchasing reduce installation and maintenance costs. These A-C units provide reduced power losses, better regulation and flexibility for expansion. Factory-assembled, wired and tested to meet all standards. Transformer types available to fit your needs include oil-filled, *Chlorextol* liquid-filled, dry-type and sealed dry-type units.

ALLIS-CHALMERS A-1483

STRAN-STEEL PUTS WORK SPACE IN A SHOWCASE

American Aluminum Company makes a product and meets its public in a single Stran-Steel building! Pre-engineered Stran-Steel gives a maximum of column-free space for fabricating operations, plus plenty of room for attractively panelled salesrooms. The building's modern low-pitched roof is a striking addition to the community, increases its customer appeal, too. And exterior panels—with a choice of 10 colorful Stran-Satin peelproof coatings—will stand up to tropical weathering for years. Easy to buy, dual purpose Stran-Steel buildings can be financed under your Stran-Steel contractor's low-cost "package deal" plan. Call him today—he's listed in the Yellow Pages under *STEEL BUILDINGS* or *BUILDINGS, STEEL.*

STRAN-STEEL
Buildings for Modern Business

American Aluminum Company of Bradenton, Florida, fabricates storm windows, doors and carports in a modern, attractive LR 60' x 194' Stran-Steel building, shown at top in Stran-Satin Blue.

CLIP COUPON AND MAIL TO STRAN-STEEL CORPORATION, DEPT. CE-20, DETROIT 29, MICHIGAN

Please send complete literature on Stran-Steel Buildings in Stran-Satin Color. I'm interested in a building approximately ____ ft. by ____ ft. to be used for ____

Name ____ *Title* ____
Company ____ *Phone* ____
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Professional Ethics

Rulings by the NSPE Board of Ethical Review on Job Procurement Procedures

RECENT DECISIONS on several matters of engineering ethics pertaining to consultants have been announced by the Board of Ethical Review of the National Society of Professional Engineers. Most of the decisions rendered concerned the obtaining of work.

Competitive Bidding

The problem: "A municipality selected three engineering firms for interview on the design of a certain water and sewage plant. Each firm proposed virtually the same fee, based on the recommended fee schedule of the state society of professional engineers. The city officials asked each firm to state a figure of the amount of reduction from the fee which it would grant, based on the fact that the city would furnish the preliminary engineering report, partial estimates during construction, all inspectors and resident engineers, and other data of value to the engineers in performing their work. The three firms discussed the request jointly and agreed on a uniform credit of $10,000 for the data and services to be furnished by the city. The engineering firms considered that an agreement among them was necessary in order to prevent the procedure from being converted from one of negotiation to one of competitive bidding, it appearing that the city would grant the contract to the firm offering the highest credit."

The questions asked and the decisions by the Board were:

¶ *Would it have constituted competitive bidding for the several engineers independently to offer the city a reduction in the fee?*

"Yes. The offer of a definite reduction in fee by each of the several firms would have constituted competitive bidding, and the firms were correct in refusing this requested course of action."

¶ *Was it ethical for the firms involved to confer and agree on a standard credit figure to be offered to the city?*

"No. While the Canons of Ethics and Rules of Professional Conduct do not specifically cover a joint agreement among several firms on a reduction of fee, public confidence and understanding of the professional nature of engineering services will be enhanced by adherence to the more desirable position of having the client select one engineering firm for further negotiation on a fee credit for services and data furnished by the client. The engineers, by conferring and agreeing on an amount of reduction in the fee, acted unethically . . . by exposing the engineering profession to public criticism and misunderstanding."

In a related problem, the Board decided that an engineer may properly bid competitively for projects which involve only subprofessional work. However, the Board members also added that it is important to teach the public the difference between professional and subprofessional work.

The decision read, in part, "It is clear that the Canons of Ethics and Rules of Professional Conduct are intended to apply only to professional engineering practice, and

FLUIDICS
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Water treatment news for the consulting engineer

Hot Water for Institutions

New technique prevents corroding pipes or scalding users

by Ralph Lemen
Manager,
Heat Transfer
Section
The Permutit
Company

TWIN PROBLEMS face the engineer who designs a hot water system for a school, hospital or similar institution.

First he must take the corrosive bite out of the water, to protect the hundreds of feet of piping involved. Normally you could use a deaerator operating at a positive steam pressure to "boil out" the corrosive gases, oxygen and free CO_2.

But problem number two is to keep the water *well below scalding temperature* — since it will be used by children, aged people, or those who are physically or mentally ill.

Part-Vacuum Deaeration: Previously, the conventional coil type hot water heater was used in these systems but this method did nothing toward removing the corrosive gases. Now, a new technique has been developed and is in use, solving both problems in one step.

Here is how you do it. A standard Permutit deaerator, which normally operates above atmospheric pressure, is adapted to function at partial vacuum. This of course permits the oxygen and free CO_2 to escape at lower water temperatures. With a steam-jet ejector to remove these gases from the unit and to produce the desired vacuum, the system is complete.

Several Now in Use: A number of these units are now operating, notably in mental institutions in Ohio. At these installations water is heated in the deaerators to about 140°F. By the time it gets to the taps, radiation losses cool it to about 132° to 135° — a good safe temperature that cannot hurt anyone.

Of course, the effluent temperature of the water produced by this type of equipment can be lower or higher than the above temperatures by operating at corresponding lower or higher vacuum conditions.

If you are planning an institutional hot-water system, consider this new way to add safety *and* corrosion resistance at one time. As a starting point, you might like copies of our technical bulletins on Permutit Deaerators. For details write to the Permutit Division, Pfaudler Permutit Inc., 50 West 44th St., New York 36, N. Y.

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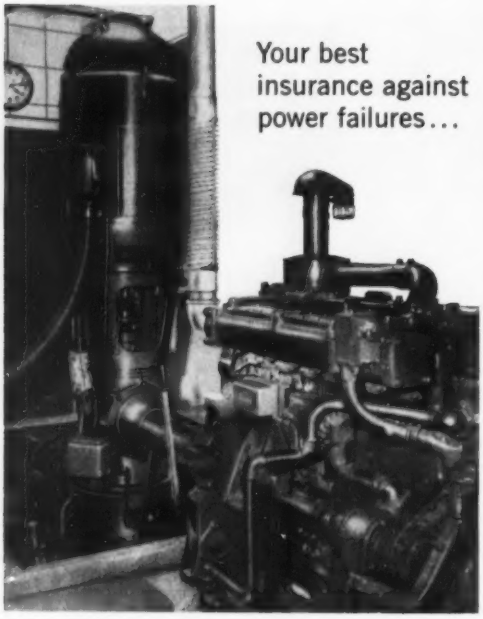

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not to business activities in which a professional engineer may engage . . . It is desirable, where the subprofessional work is a large part of the firm's activities, to operate through a separate form of organization, with a distinct name. Where this is not practicable . . . the engineer should adopt other means to segregate the types of work, including references in the contract or in correspondence."

Conflict of Interest

The problem: "A state sanitary engineer works with communities in promoting adequate sewage and sanitary installations. Some small local communities become interested in the program and desire to construct appropriate facilities. These communities ask the state sanitary engineer for a list of qualified consulting engineers to handle such work. The plans prepared by the consultants will require approval by the state sanitary engineer or his office."

¶ Should the state sanitary engineer submit a list of consultants?

¶ If so, should he restrict this list to those firms known personally to him and which he believes to be qualified?

The majority decision was "No. We believe it would be more prudent for the state sanitary engineer to avoid placing himself in a situation which might even raise the question of a 'conflict of interest,' or any inference that the extent of his criticism of the plans was in any way limited by the fact of his prior endorsement of the firm as qualified. He should be in a completely independent position in reviewing the plans submitted."

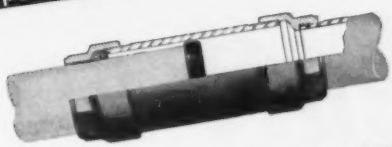
However, two of the seven Board members stated: "We believe a state sanitary engineer, upon request by community officials, could submit a list of qualified consulting engineers. It should be made clear, either in the conversation or in the letter of transmittal, that the state

in the long run... it's O.Z.

Type AX

Provides 4" expansion, contraction movement. Malleable iron head, body Hot Dip Galvanized. Weatherproof head sealed by factory-installed high grade graphite packing. Insulating conduit end bushing eliminates cable abrasion. 10 sizes for conduit ½" to 4" diameters.

Type EX



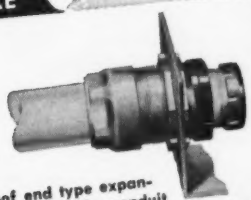
Permits 8" conduit movement. Optional length sleeves, additional cost. Weatherproof head sealed by factory-installed high grade graphite packing. Insulating bushings prevent cable abrasion. Hot Dip Galvanized finish. 12 sizes for ½" to 6" conduit diameters.

Type DX

Patented

Compensates for deflection, expansion, contraction. ¾" movement all directions from normal; 30° angular movement. Also used as vibration damper between conduit sections. 10 sizes. Watertight (NEMA 4) and submersible under 25 ft. head of water.

Type EXE



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Type TX

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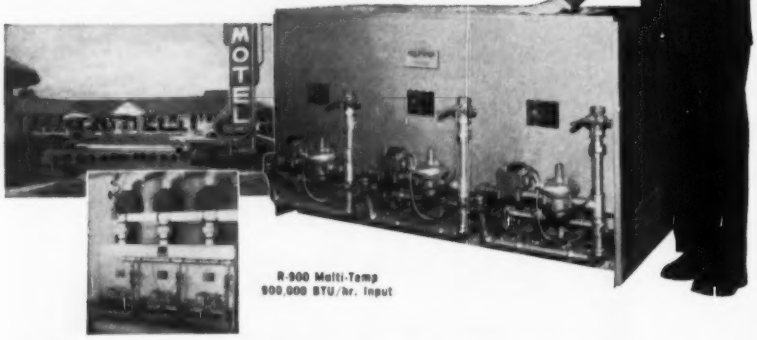

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sanitary engineer is, of course, assuming no responsibility for either the selection or the work of the consulting firm. It also would be highly desirable to indicate both in the conversation and in the letter of transmittal that he would recommend that the community officials consult several of these firms and make their own selection on the basis of the concern that they judge would give them the best service. The sanitary engineer also should indicate that there are other qualified engineering firms not indicated on his list.

"We would think that a list should cover primary firms which he knows personally are qualified, but we see no objection to including firms which he does not know personally but from reliable sources have a good reputation in the fields required for this consulting work. Undoubtedly, the state office and other sanitary engineers associated with that office will have information on qualified concerns with which he may not be personally acquainted.

"Frankly, if we were officials of a community and required the services of a qualified sanitary engineering firm, we would expect that we could get dependable information from representatives of the state who are continuously concerned with this sort of work. We would expect this as a service from the state's personnel, and we would recognize that obtaining this information would in no way affect or change their responsibility to us or the public in connection with detailed review of any plans they might be submitting."

Practice Outside Major Field

The problem: "Engineer A has a degree in mechanical engineering and is registered as a professional engineer under the state engineering registration law. He has had 15 years of experience in mechanical engineering work, including 7½ years of mechanical and electrical design of all types of build-

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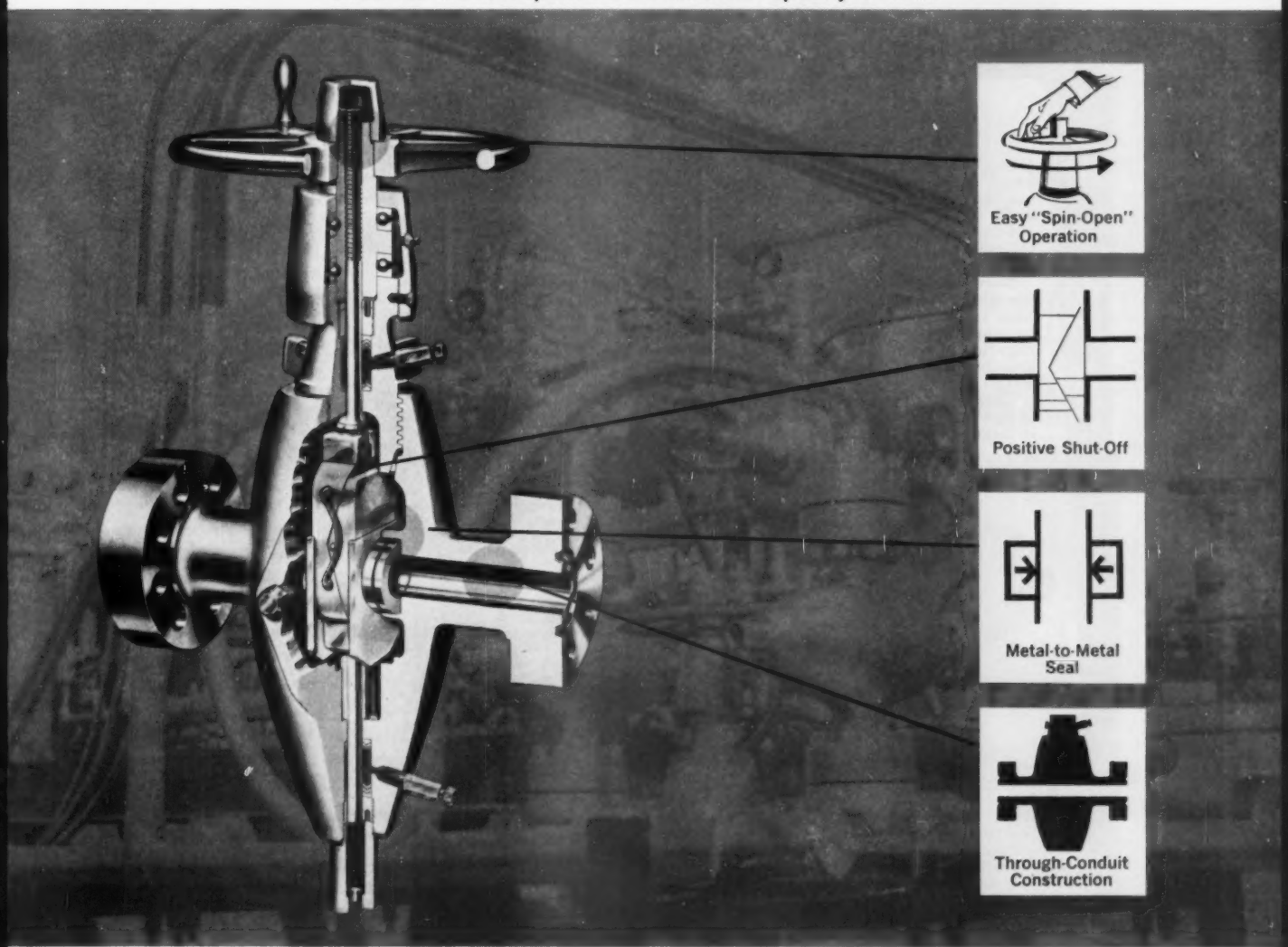

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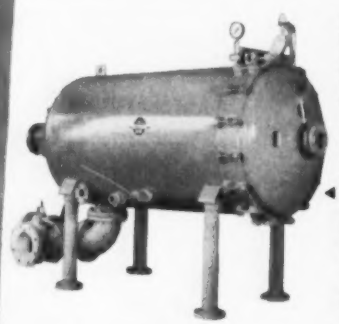
Now the new large volume diatomite filters engineered by Sparkler have been tested in hundreds of successful installations in many industries and for municipal water supply, and have almost completely replaced sand filters for swimming pool filtration in schools, clubs, and municipal pools because of the greatly reduced chemical treatment necessary, to produce safe water.

This new phase of water filtration is worthy of careful investigation and study by all consulting engineers who are engaged in large volume water filtration.

MODEL RJ



A closed tank, pressure filter, with self cleaning features. The spent diatomite cake is peeled off the plates with the exclusive Sparkler Hydro-Scraper knife edge pressure spray and is washed out of the tank through the sloping bottom drain. The complete cleaning operation including precoating and recirculating for clarity ready for resuming operation is less than 30 minutes; a completely new uncontaminated filter media is thus provided. Filter element and spray tubes have no metal to metal contact with tank, thus providing electrolytic protection. Fully automatic electronic operation can be furnished.

Capacities are available in a single unit for 1,500,000 gal. per 24 hr. operation.

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Both filters have synthetic cloth covered plates that are removable without bolts or fastenings.

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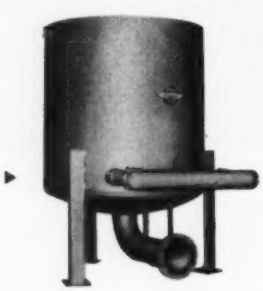

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ings. He has designed the electrical systems for several buildings.

"Engineer B, holder of a degree in electrical engineering and registered as a professional engineer under the state law, filed a complaint with the state society of professional engineers, alleging that Engineer A had acted unethically in designing electrical systems in view of his education and registration based on his proficiency as a mechanical engineer. The complaint does not question the competency of Engineer A, nor were any plans submitted by Engineer B to sustain a charge of lack of quality of the design work of Engineer A, even though such plans were requested by the society."

¶ *Is engineer A allowed to practice electrical engineering when his major field is mechanical?*

"Yes. Whether or not an engineer is qualified for particular work is a question which can be determined only on the basis of demonstrated technical knowledge as shown by experience and training. While the type of education in an engineering school is a material factor in this evaluation, it is not controlling or all-inclusive.

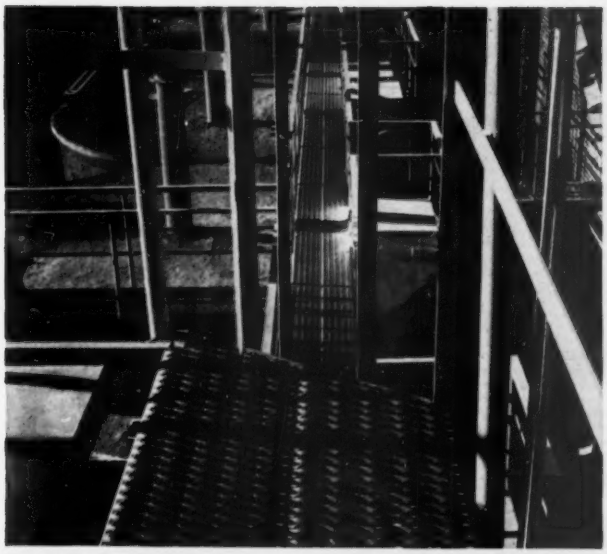
"It is a known and accepted fact that one's training and experience continue throughout a professional career, and it would be folly to assume that an engineer could never become qualified beyond those subjects which he studied in college. It is beyond doubt that a large number of engineers (perhaps even a majority) move into new or related fields of professional endeavor as they gain experience."

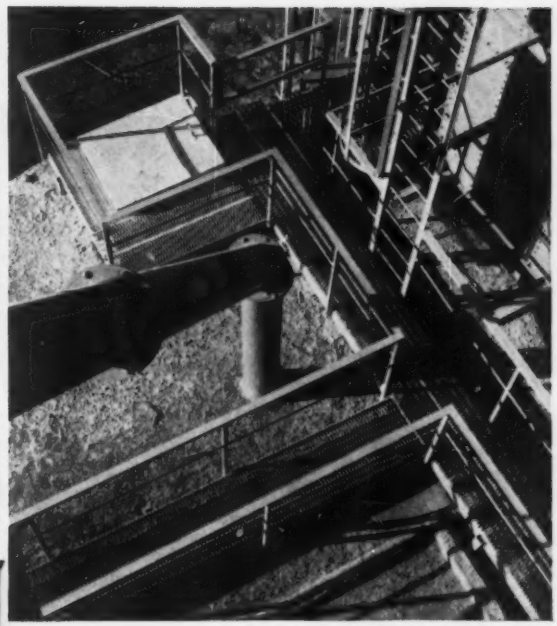
¶ *Is engineer B required to substantiate his claims of incompetency by exhibits?*

Without further comment, the Board decided that engineer B must back up his charges with physical proof.

Gifts

The old question of when is a gift an expression of good will and when is it a bribe was discussed in





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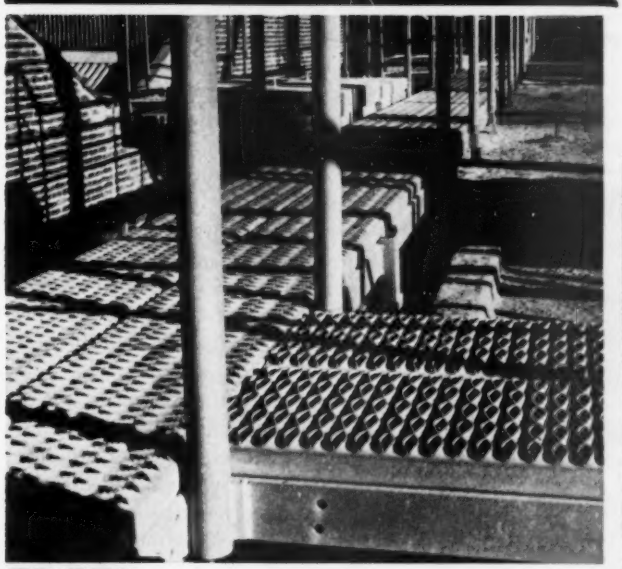

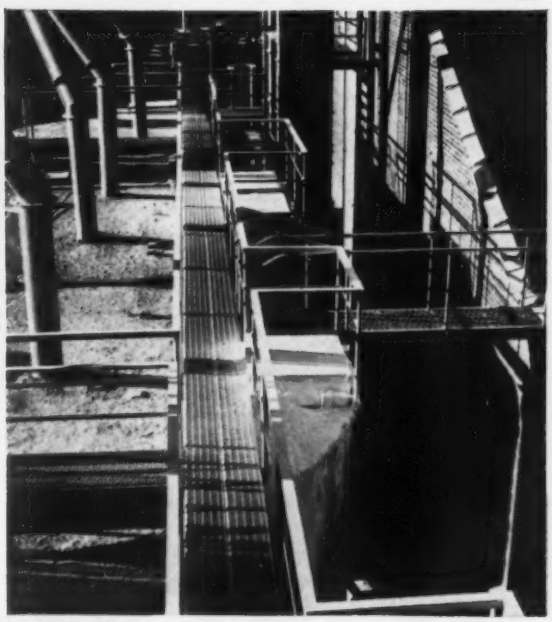

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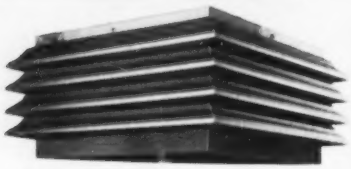

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three cases and opinions rendered.

¶ A consulting engineer who has done considerable work for a public body makes it a practice to take certain staff engineering employees of the agency to lunch or dinner three or four times a year, at an average cost of $5 per person. He also makes it a practice to give certain members of the engineering staff Christmas presents at an average cost of $10 each.

Decision: "Occasional free luncheons or dinners and Christmas presents of relatively small value do not exceed the bounds of ethical behavior by the giver or receiver."

¶ Certain engineering employees of an industrial firm, who are in a position to recommend for or against the purchase of products used by the company, regularly receive cash gifts ranging from $25 to $100 from salesmen.

Decision: "Inasmuch as it does not appear that the employees performed any services for the cash gifts, and in view of their position of responsibility and trust to the employer, the receipt of such cash gifts immediately raises a doubt as to the integrity of the employees and leaves an impression that the intent is to influence their discretion in favor of the giver. Acceptance of cash gifts in such circumstances is an unethical act."

¶ Upon completion of a major engineering contract held by a consulting engineer, the chief engineer of the client, who worked directly and intimately with the consultant receives a new automobile from the consultant with a letter stating that the gift is in appreciation of his close and friendly cooperation and assistance in the successful performance of the work. Cost of the car is about $4000.

Decision: "It is unethical to offer or receive such a gift . . . It might be inferred by reasonable men that one who had received an expensive gift would be under at least moral pressure in any future consideration of awarding additional work to the consultant." ▲▲

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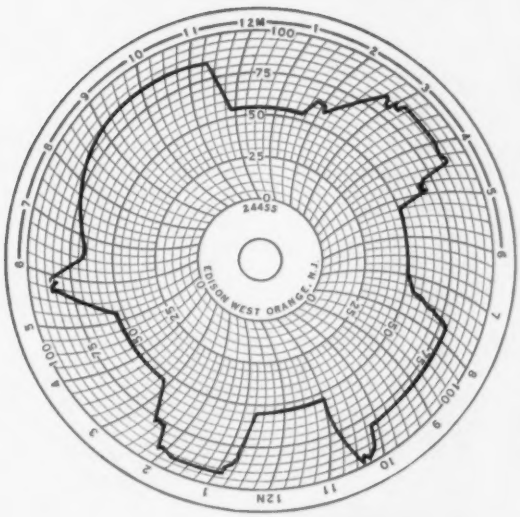

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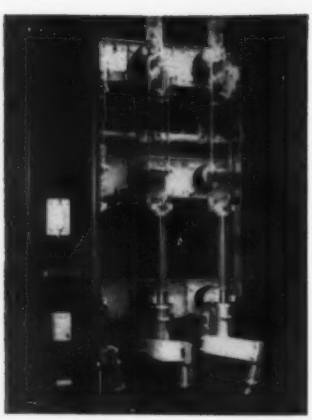


Inside view of typical bay, showing load interrupter (for switching), power fuses, and out-going pothead.

A Power Fuse both senses and clears short circuits— cuts cost of metalclad switchgear 50%

With S&C Metalclad Switchgear you get dependable protection for your high-voltage power circuits at about half the cost. How? Partly through the use of S&C Power Fuses instead of circuit breakers and relaying.

The power fuse is self-sufficient. It needs no instrument transformers, no relay. There is nothing to set, adjust, test, or maintain. You don't need special equipment or skills. After the fuse clears the fault and the cause has been corrected, you simply reach for a $13.50 refill stored in the compartment door.

Power fuses give you the protection you need against permanent destructive faults. Industrial and commercial high-voltage power circuits are not subject to transient faults (such as lightning, falling trees, wind, ice, rodents) and so don't need the automatic reclosing feature of the circuit breaker.

S&C fused interrupter gear meets the new National Electrical Code requirements for fault closing. It is available in short circuit interrupting ratings up to 500 mva at 14.4 kv, 250 mva at 4.16 kv. Continuous current ratings are 200, 400, and 720 amperes. Maximum capacity of main bus, 2000 amperes.

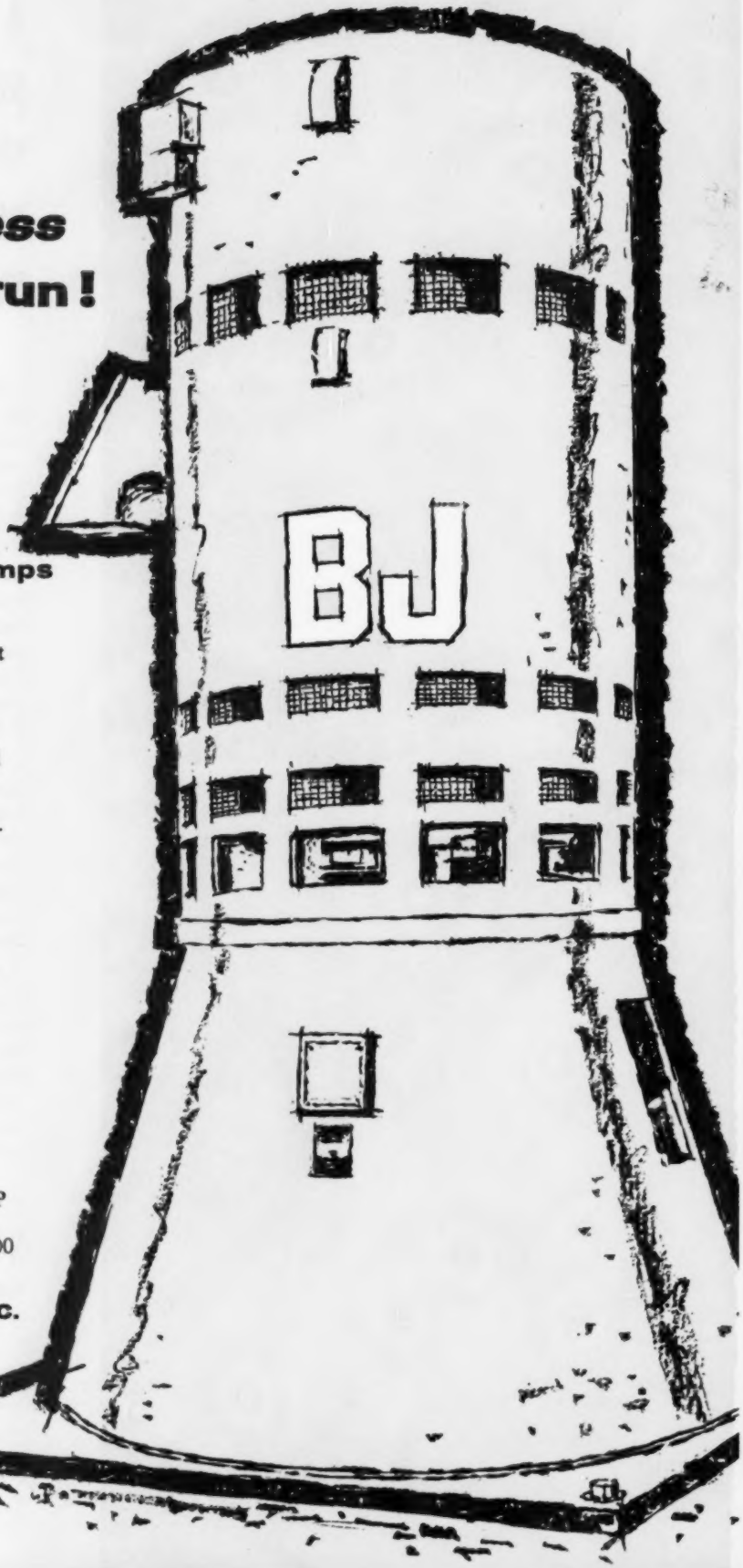
S & C ELECTRIC COMPANY

4436 Ravenswood Avenue Chicago 40, Illinois

Specialists in High Voltage Circuit Interruption since 1911

S&C

Quality *costs less* in the long run!



BJ Vertical Circulating Pumps

Designed to deliver water in large volume, BJ Vertical Circulating Pumps are in use on some of the Nation's largest industrial and governmental projects.

These BJ Quality Pumps are ideal for cooling tower circulation, irrigation service, flood control projects, municipal primary water pumping, river intake, dewatering for large construction, condenser circulation, industrial processing and other big jobs which demand the economy of long, reliable service.

Operating continuously with high efficiency, BJ Circulating Pumps are self-priming and require only a simple installation. Available in capacities to 50,000 GPM *in standard models,* and beyond on special order!

San Luis Water District

Located in California's San Joaquin Valley, the state's largest private agricultural improvement project has installed 10 BJ Vertical Circulating Pumps. Five at Station #1 total 4100 HP and deliver 69,600 GPM, while five more pumps at Station #2 handle 53,900 GPM using 2150 HP.

BYRON JACKSON PUMPS, INC.

Subsidiary of Borg-Warner Corporation

P. O. Box 2017-A, Terminal Annex, Los Angeles 54, California

BW

The New Projects

Europe's Largest

The government of Portugal has awarded contracts for the construction of the Tagus River bridge to the United States Steel Export Company and International Morrison-Knudsen Company, Inc. A four-year project, the Tagus River bridge will be the longest clear-span bridge in Europe and the fifth longest in the world when completed.

The central span of the bridge will be 3318-ft long, the two side spans each 1540-ft long. With approaches, the roadway section will be about eight-miles long.

One of the major piers for the bridge will be the deepest in the world – extending 270 feet below water level to bedrock. When completed, the bridge will carry four lanes of traffic, with provision for a double-track railroad. Consultants on the project were Steinman, Boynton, Gronquist and London, of New York; and Tudor Engineering Company, of San Francisco.

Los Angeles Art Center

The Los Angeles County Board of Supervisors has endorsed a plan to expand the city's present Music Center to a complete center of the performing arts. The proposal calls for the construction of a forum and a theater, in addition to the existing auditorium.

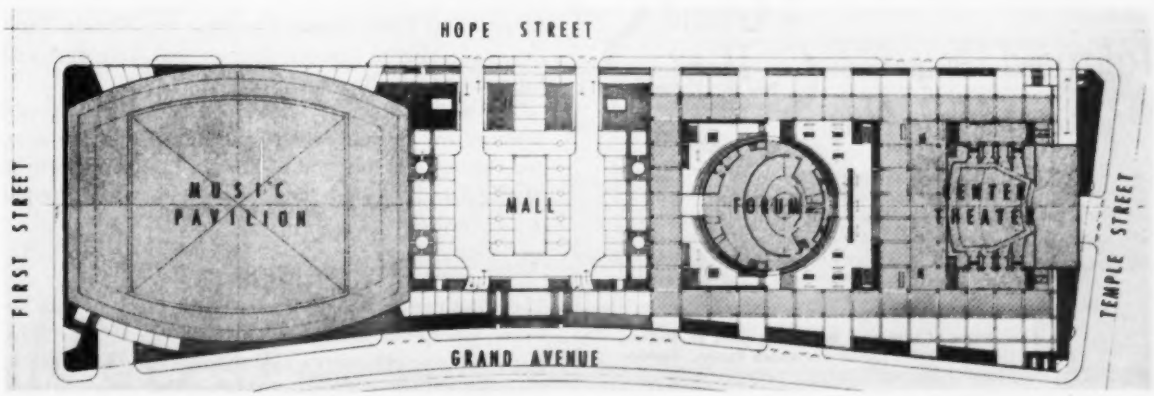
The art center will be located on a 7-acre site between First and Temple, and Hope and Grand Streets. The entire project, to be completed in 1963, will cost about $20 million, financed largely through private subscription. Architect-engineer for the new buildings will be Welton Becket & Associates, of Los Angeles.

Power Boost for Costa Rica

A loan of $8.8 million, for the expansion of electric generating and transmission facilities in Costa Rica, has been made by the World Bank. The loan will help to finance construction of a 30,000-kw hydroelectric plant on the Rio Mache, the installation of a 9000-kw diesel generating plant for Colima and Limon, and the extension of the country's central transmission network. The new facilities will provide a 40 percent increase in power generating capacity in the Central Zone, which embraces the capital, San Jose.

Army Research Center

Associated Nucleonics, Inc., a subsidiary of Stone & Webster Engineering Corp., of New York, has been selected to design a new research station for the U. S. Army Quartermaster Corps, at Natick, Massachusetts. The center, expected to cost nearly $2 million, will be used for experiments in the preservation of food



The proposed Southern California Center for the Performing Arts, planned for the seven-acre Civic Center site in L. A.

Insure Safety In Hospital Operating Rooms

ZENITH Ground Detector

- Zenith Model ZGD warning unit is designed for hospital operating rooms where hazardous grounding of the isolated voltage system may be encountered.
- Green light indicates normal or safe condition. When grounding occurs the red light and buzzer warn hospital personnel of danger. The unit will detect up to 60,000 ohms leakage to ground and will not allow over 2 milliamperes to pass through the system.
- UL approved. Meets National Board of Fire Underwriters Standards.

Write today for details. Ask for engineering data sheet 14R-0001 describing the ground detector and indicating units.

ZENITH ELECTRIC CO.

152 West Walton Street • Chicago 10, Illinois

Relax and Play on Mobile Bay

Grand Hotel
POINT CLEAR, ALABAMA

A distinguished resort that's as popular for corporation meetings as it is with honeymooners and vacationing families! Occupying Point Clear on Mobile Bay, Grand Hotel is an internationally-famous pleasure-land for the discriminating. Superb cuisine and luxurious comfort in the intimate club atmosphere of a 350-acre estate. 100% air conditioned. American Plan.

Home of Lakewood Golf Club, scene of All-Star Golf matches (ABC) and annual Seniors' Tournament.

James P. Pope, Resident Manager

GRAND HOTEL — Point Clear, Alabama

Murray Stevenson, Vice President

Owned and operated by Southern Industries Corporation, Mobile, Ala.

by atomic radiation. The research station will house the largest cobalt-60 radiation source in the country, and also will have a large linear accelerator to irradiate foods with high-velocity electrons.

Hall Named for Engineer

The new men's dormitory at Kansas Wesleyan University, in Salina, Kansas, has been named "Murray A. Wilson Hall for Men," in honor of the new president of NSPE. The honor was given in recognition of Wilson's many years of service to the school.

The $493,000 dormitory was designed as a concrete frame structure, with masonry walls and liberal use of glass. It will house 152 men.

Wilson has served for many years on the Board of Trustees for Kansas Wesleyan, and since 1955 has been chairman of the executive committee. In 1953, the school awarded him the honorary degree of Doctor of Humane Letters.

Murray A. Wilson dormitory, named for Kansas consultant.

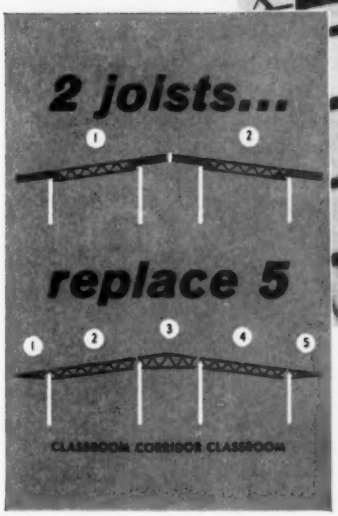
NYC Waterfront Study

Three New York firms have signed a joint venture contract with city officials for a one-year study of the North River waterfront of Manhattan, between the Battery and 72nd Street. The firms are Ebasco Services, Inc.; Moran, Proctor, Mueser and Rutledge; and Eggers and Higgins, architects.

The study, at an estimated cost of $300,000, will consider the present waterfront facilities in the area, and the changes that will be needed to expand them to handle the projected flow of passenger and freight in the next 40 years.

Dallas Insurance Building

The Southwestern Life Insurance Company has selected George L. Dahl, Dallas architect-engineer firm, to design the company's new home office building in downtown Dallas. Construction on the new building is expected to begin late this year, and the tenants will



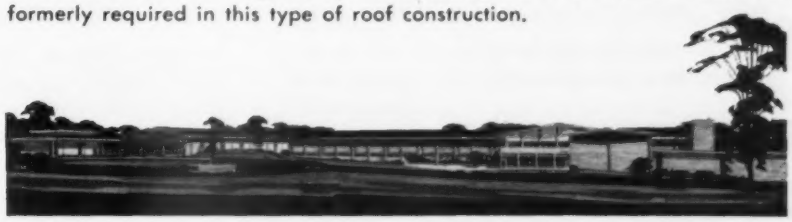
LACLEDE 34′ OPEN WEB STEEL JOISTS

cut time and cost in new school construction

Ladue Junior High School in suburban St. Louis is an excellent example of the way economy and style can be blended in today's school construction.

Cost saving was a pre-eminent factor in architect William B. Ittner's design of this low-flung structure, with its long straight runs, free of costly jogs and bends. Further economy was achieved by allowing the rolling terrain to fall away from the single continuous ridgeline, rather than to follow the contours of the ground with multi-level roofs.

This design concept was based on the selection of open web steel joists as a versatile, economical structural material. Laclede 34′ joists, with special shallow-depth ends, were used to provide an unbroken slope from ridgeline to cantilevered overhang, two joists replacing the five structural elements formerly required in this type of roof construction.



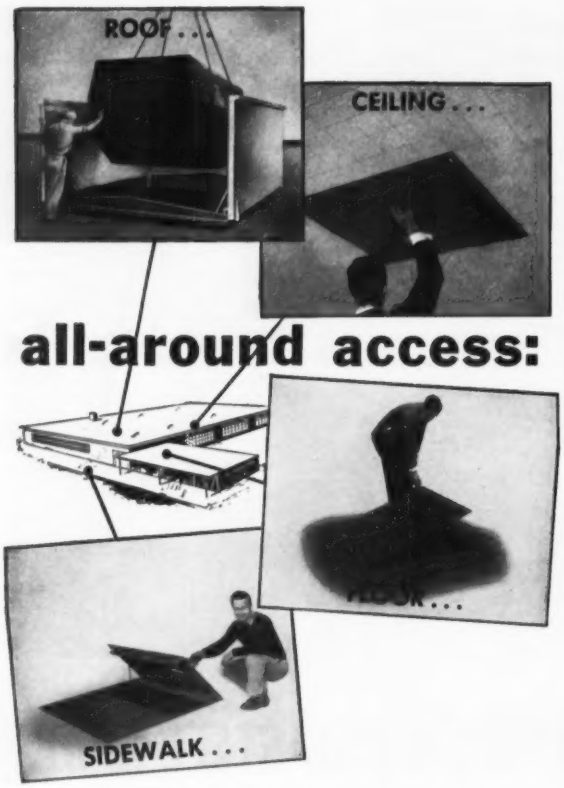
General contractor on the project was Kloster Company. Neal J. Campbell was consulting engineer.

6070

LACLEDE

LACLEDE STEEL COMPANY

SAINT LOUIS, MISSOURI ◆ Producers of Steel for Industry and Construction



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Ease of installation, permanent weather-sealing, and rugged construction are all part of the Bilco quality tradition. Exclusive design features include built-in spring operators for effortless lifting of even heavy plate doors. Bilco all-metal doors give you freedom of design, too—they fit and blend with any structure.

Specify Bilco doors...design with Bilco doors in mind...with confidence in Bilco lifetime quality.

See our catalog in Sweet's Architectural & Engineering Files or send for it.

Bilco®

HORIZONTAL SPRING-OPERATED DOORS

The Bilco Co., New Haven Conn., Dept. A-835
Please send me your new catalog on special service doors.
NAME
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STREET
CITY ZONE STATE

move in by the end of 1962. The new offices will contain about 150,000 square feet of usable space.

New Armour Building

The Detroit architect-engineer firm of Giffels & Rossetti, Inc., has been selected to do the design for the Armour and Company's new plant at Kankakee, Illinois. The $6.5 million project will include three buildings in a refinery complex. Target date for completion is mid-1962.

Public Utility Air Conditioning

Hartford, Connecticut, has one of the most extensive and elaborate urban renewal projects of any American city. Plans call for re-routing major arterials, bridges, tunnels, and the construction of dozens of large residential, commercial, and municipal buildings. Faced with the problem of air conditioning all these buildings, consultants Seelye, Stevenson, Value and Knecht, of New York, proposed a public utility providing the means for heating in winter and cooling in summer.

Through its new plant in the Southeast section of the city, the Hartford Gas Company plans to supply

Aerial perspective of Hartford, Connecticut, showing the new supply plant and proposed cooling and heating lines.

steam and chilled water to air condition several large building complexes. Original plans call for service to the Constitution Plaza, the Travelers Insurance Company building, and other commercial enterprises. Initially, the plant will have a total capacity of 6000 tons of cooling, or 150 thousand pounds of steam per hour.

Among other advantages, this central system will cut installation and maintenance costs for the indi-

a sensational new advance in lighting technique

from **SMOOT-HOLMAN**

John Murray, Supervisor of Electrical Engineering Section, Plant Engineering Dept., Douglas Aircraft, and Jim McCormick of Smoot-Holman make final inspection of Missile Group Engineering Department, Culver City, California.

HERE'S WHY DOUGLAS AIRCRAFT CHOSE "PVs"

● **BETTER LIGHTING** "PV" means Perfect Vision® Lighting and that is exactly what Douglas wanted and got for its engineers. The initial foot candle reading in every section of the 120,000 square foot room illustrated above was *in excess of 200 foot candles* with no glare or hot spots.

● **LOWER FIRST COST** The *installed* cost of fixtures was slightly less than $1.20 per square foot (fixtures 90 cents, installation cost 30 cents).

● **LOWER MAINTENANCE COST** Maintenance of fixtures has been reduced to a minimum through proper design. Porcelain enamel inner reflector and metal louvers in bottom of fixtures prevent dust or bugs from collecting so eliminates need for frequent cleaning. Perfect ventilation increases lamp life.

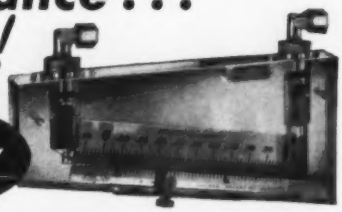
● **NO NOISE—NO HEAT** Ballast sound (hum) is eliminated in working area through unique method of installation whereby the isolated ballasts are suspended above the ceiling and connected to fixture with a flexible wireway. Ballasts located in this manner dissipate heat above the ceiling so it does not reach working area. Cost of air conditioning is reduced.

● **CREDITS** Mr. Murray pictured above has this to say: "Smoot-Holman, working with Holmes and Narver, Inc. (Consulting Engineers) and Pacific-Western Co. (Electrical Contractors), have accomplished a superb lighting job."

Write for detailed information

SMOOT-HOLMAN *Company* ESTABLISHED 1915 *Inglewood, California*

FILTER EFFICIENCY
at a glance . . .
anytime!



Dwyer

AIR FILTER GAGE

With the Dwyer Air Filter Gage you can be sure of maximum filter efficiency because you know the *exact* time to replace filters, *every time.* Gives a continuous, accurate check that spots inefficient filters, yet prevents waste through premature replacement.

The Dwyer measures filter efficiency the only practical and economical way—via pressure drop. Quickly pays for itself through savings in replacement and service time and greater operating efficiency.

Break-proof plastic construction, lifelong accuracy, simple installation, no moving parts to ever wear out or get out of adjustment. Ranges 0-½", 0-1", 0-2" and 0-3" water. A complete unit with all necessary tubing, fittings, etc.

Write for Bulletin C10

F. W. DWYER MFG. CO.

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Four Fine Facilities in PITTSBURGH

ALLEGHENY MOTOR INN

Opposite Greater Pittsburgh Airport. 60 air-conditioned rooms, tile bath, TV, radio, phone. Superb restaurant and cocktail lounge. Year-round swimming pool. Courtesy car to and from airport. **AMherst 4-7790**

HOTEL PITTSBURGHER

In the heart of the Golden Triangle. 400 outside rooms, bath, radio, TV, air-conditioning. General Forbes Lounge & Dining Room. **ATlantic 1-6970**

JACKTOWN MOTOR HOTEL

1 mile west of Irwin Interchange on Route 30. 60 air-conditioned rooms with TV, telephone, combination tile baths. Excellent dining room and facilities for group parties. **UNderhill 3-2100**

HOTEL PITTSBURGHER MOTEL

Opposite Greater Pittsburgh Airport. 56 air-conditioned rooms, tile bath, radio, TV, private phone. Courtesy car to and from airport. **AMherst 4-5152**

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Joseph F. Duddy, Gen. Manager

Teletype Service. Telephone any Knott Hotel. All Knott Hotels and offices in U.S. connected by teletype.

Route 30, Lincoln Highway,

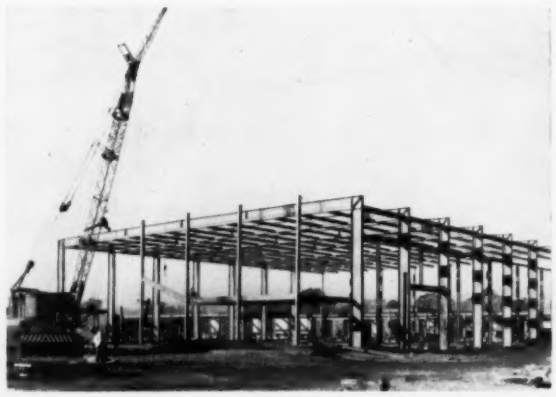
Shortest Route to Pittsburgh

vidual buildings served, and will provide more usable work space in these buildings.

Another Longest Span

Construction has begun on the longest steel span in the United States designed according to the plastic theory, at the Georgia National Guard Armory, in Savannah. The armory drill hall is framed by rigid-frame bents, spanning 120 feet without intermediate support.

The entire project will cost about $625,000, including site appropriation and parking facilities. The



Placing of rigid steel bents at new Armory in Savannah, Ga.

architect-engineer for the project, Thomas-Driscoll-Hutton, of Savannah, reported a saving of 15 percent in structural steel through use of the plastic theory.

Cullen Center Hotel

Officials of the $100 million Cullen Center, in Houston, Texas, have ordered preliminary plans for a new 10 story, 250 room hotel, to be ready for occupancy in 1962. The $4 million hotel is being designed by Welton Becket and Associates, of Los Angeles, who have been retained as architects and engineers for the entire project. The hotel will be designed to permit construction of additional floors in the future.

Advanced Test Reactors . . . In Idaho

The Atomic Energy Commission has accepted a proposal of Ebasco Services, of New York, for performance of architect-engineer services in connection with an advanced test reactor planned for the Commission's National Test Station near Idaho Falls, Idaho. Congress has already authorized $24 million for the project, and work is scheduled to begin this spring.

. . . In Tennessee

The Oak Ridge, Tennessee, National Laboratory of AEC is experimenting with a molten salt type reactor with potential application to the production of

WORKING COMBINATION FOR YOUR AIR AND WATER LINES

NAYLOR Wedgelock couplings make a positive connection securely anchored in standard weight grooved ends.

With NAYLOR Spiralweld pipe and Wedgelock couplings on the job, you have a combination that works to save you time, trouble and money.

You save time in handling NAYLOR pipe. It's easier and faster to install because its lockseamed-spiralwelded structure creates a light-weight pipe without sacrifice of strength and safety.

You'll like the way Wedgelock couplings save time and work, too. They simplify and speed connections since joints can be made up with only one side of the pipe in the open and a hammer is the only tool required to connect or disconnect them.

Look into this NAYLOR pipe and coupling combination for air, water, and ventilating service.

Write for Bulletin No. 59

NAYLOR PIPE *Company*

1276 East 92nd Street, Chicago 19, Illinois

Eastern U. S. and Foreign Sales Office: 60 East 42nd Street, New York 17, N. Y.

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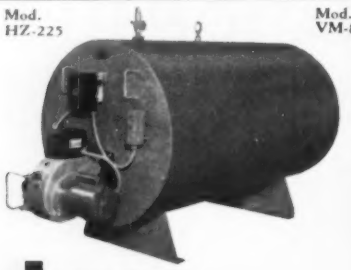

Mod. VM-80

JOHNSON

"Heat Servant"

Automatic Boiler-Burner Units for

HOT-WATER SUPPLY *and* HOT-WATER HEATING

These handsome units are engineered to a new high point of heating efficiency to bring you lower water-heating costs and more years of trouble free service. They are powered by Johnson's famous Bankheat Burners which can be fired on Oil, on Gas, or on Combination Oil-and-Gas.

There are 2 space saving Vertical "Heat Servant" Models built in a wide range of sizes from 80 to 1000 MBH . . . and 2 Horizontal Models (of 3-pass Scotch Boiler type) that range from 100 to 2000 MBH in size . . . making it possible to get exactly the right size and type. All "Heat Servant" units are factory assembled, wired and tested.

Whatever your need may be . . . domestic hot-water supply . . . or heating a building with hot water (or low-pressure steam), there's a Johnson "Heat Servant" that will do the job better and more economically. May we send detailed descriptions and data?

Johnson Oil Burners

S. T. JOHNSON CO.

940 ARLINGTON AVE. OAKLAND 8, CALIF.

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New! on MICHIGAN AVE. at 12th St. in Chicago

Modern Luxury in Downtown Chicago

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Members: AAA Best Western Motels Quality Courts

Closest to all Chicago convention centers. Suites and sample display rooms. Private meeting and banquet rooms.

All major credit cards accepted.

Write for rates, free maps and folders.

Avenue MOTEL

Michigan Ave. at 12th St., Chicago, Ill.

commercial electric power. Design and supervision of much of the work is being done by Burns and Roe, of New York. The $4 million project is due for full operation by spring of 1963.

New REA Head

Now directing the Rural Electrification Administration from the offices of the Department of Agriculture in Washington is a Lancaster, Wisconsin weekly newspaper publisher. He is Norman M. Clapp, longtime public power supporter. Clapp, appointed by President Kennedy, succeeds David Hamil in the $20,000 a year post. He is a brother of Gordon Clapp, former Board chairman of the Tennessee Valley Authority.

Super Post Office

One of the nation's most controversial projects, the new United States Post Office in Providence, Rhode Island, now is operating at full capacity, and apparently without trouble. The post office uses electronic equipment to separate packages from letters, to cancel stamps, and to sort mail according to destination.

The first fully-automated post office, at Providence, R. I.

In addition to the automatic mail handling, the building has an automatic heating system, designed by Charles A. Maguire & Associates, of Providence. Maguire specified a high temperature hot water system for the 300-ft by 420-ft building, with water supplied from the boiler at 230-245F. Two, 500-hp boilers, operating on either oil or gas, handle a heating load of about 23 million BTU.

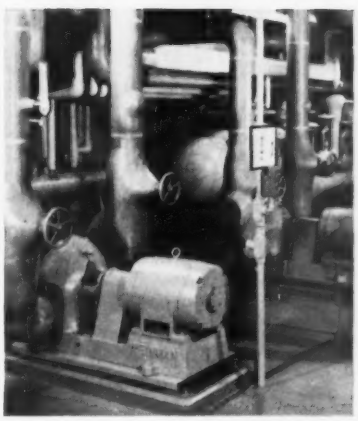
Delaware Bridge Study Continues

The Delaware Memorial Bridge Commission has authorized the New York consulting firm of Howard, Needles, Tammen & Bergendoff to resume a $148,000 feasibility study for a proposed second Delaware River bridge between Delaware and New Jersey. The first bridge, started in 1948 and completed in 1951,

Effective heating and cooling depends on a constant supply of water . . . in the right quantities . . . at the right temperature. That's why Weinman Pumps are specified as an integral part of the heating and air conditioning systems designed into today's buildings. Engineers and architects, alike, know Weinman's line of centrifugal pumps is their best assurance of pumping performance to meet precise requirements. Maintenance engineers, too, prefer Weinman pumps for rugged durability, easy maintenance and dependable, 'round-the-clock service.

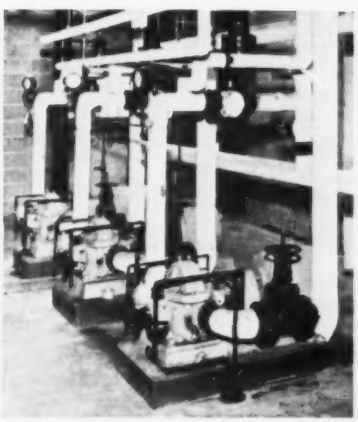
Across the nation...

WEINMAN IS THE STANDARD IN PUMPING PERFORMANCE



IN OHIO

The world's largest electrically powered air source heat pump, at the Columbus and Southern Ohio Electric Company, depends on 12 Weinman Pumps for circulating all liquids through the system.

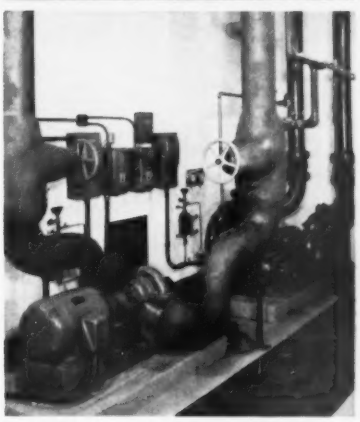


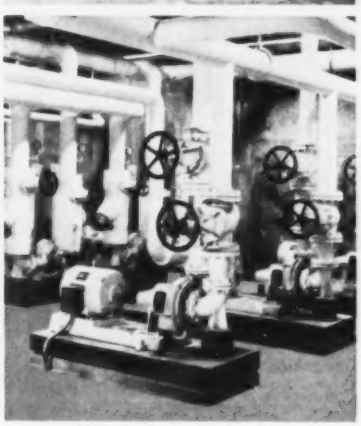
IN PENNSYLVANIA

A battery of Weinman Pumps delivers water from a central heating plant to the 30 building complex of the new state-operated Institution for Defective Delinquents in Luzerne County.

IN MISSOURI

Seven Weinman Pumps move hot and chilled water through the air conditioning system; remove sewage and deliver water to a decorative pool and waterfall at Old American Insurance Company's new Kansas City headquarters.





IN COLORADO

Denver's First National Bank Building gets efficient handling of condenser and chilled water for its air conditioning system with an installation of 6 Weinman Pumps.

Whatever your pumping need . . . there's a Weinman Pump to fit your precise specifications. For qualified recommendations consult your Weinman Specialist . . . he's in the Yellow Pages . . . or write direct.

THE **WEINMAN PUMP** MFG. CO.

290 SPRUCE STREET COLUMBUS 15, OHIO

CENTRIFUGAL SPECIALISTS

cost an estimated $44 million. The second bridge, planned for construction about 300 feet north of the first, will cost an estimated $120 million.

Union Water System

The Ontario, Canada, Water Resources Commission has opened a new water supply system serving several towns in southwestern Ontario. The $3.8 million project, financed by the towns involved and the Heinz Company of Canada, includes a 12 million gallon per day pumping station and a 333,000 gallon storage tank. Consulting engineer for the project was C. G. Russell Armstrong, of Windsor, Ontario.

$14 Million Saving at Kariba

The British engineering firm of Sir Alexander Gibb and Partners has announced a reduction in the projected cost of the Kariba Dam on the Zambesi River. Increases in the cost of civil engineering work, and in the resettlement of displaced natives, were more than offset by substantial savings in the electrical and mechanical work. The original cost of $222 million has been reduced to about $208 million.

New Solar Battery

Engineers of the French Society for the Study and Industrial Application of Solar Energy have completed a prototype model of a new solar battery. The new machine uses the sun's energy to heat a thermocouple, producing an electric potential of about 100 watts at noon on a bright day. Actual usable power over an extended period is only about two watts.

Airports in Ethiopia

The New York firm of Ammann & Whitney-Husted is completing the design of two new airports for the Ethiopian government. In addition, the Ethiopian Airlines hope to expand the present facilities at Addis Ababa and Asmara to handle jet transports. New construction is scheduled for completion in 1962.

New Potash Plant

American Metal Climax, Inc., has selected Jacobs Engineering Co., of Pasadena, California, to do the complete engineering, design, purchasing, and construction management for its new $7 million plant for producing nitrate of potash at Vicksburg, Mississippi. The plant and its facilities are the culmination of a 6-year, $1½ million exploration and research program by AMC.

Ceylon Power Plant

The government of Ceylon has awarded two Swedish construction firms the contract for building a new hydroelectric power plant in Central Ceylon, about 40 miles from the capital city of Colombo. The $7 million project will take about three years to complete.

The new power station, with a head of 425 feet, will produce 50,000 kw. Four miles of tunnels will be dug to complete the station. Consulting engineer is Preece, Cardew, Rider, of London, England.

Parking Expansion

The planned $800,000 addition to the parking ramp at the Beverly Hilton Hotel, in California, will make it the largest hotel parking facility in the world. The actual expansion program consists of building a new four-level ramp on top of an existing two-level ramp. Rockwin Engineers, of Santa Fe Springs, designed and is producing the new structure entirely of precast, prestressed concrete components.

Architect-engineer for the entire hotel complex is the Los Angeles firm of Welton Becket and Associates.

California Automobile Plant

The San Francisco architect-engineer firm of John S. Bolles has been retained as consultant for the new Chevrolet and Fisher Body Division assembly plants in Fremont, California. Bolles has retained the following consultants for the project: Chin & Hensolt – structural; Eagleson Engineers – mechanical; L. Patton – electrical; and Lawrence Brian – civil.

The new General Motors facilities will occupy a site of approximately 300 acres, with about two million square feet of space in single-story, open steel frame buildings with partial second floors. ▲▲

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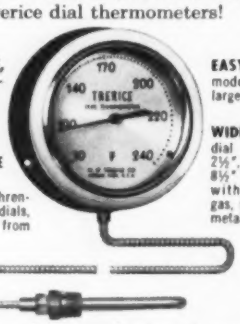
with TRERICE
DIAL THERMOMETERS

If you are after precise, dependable temperature indication, take a close look at these high-quality features of Trerice dial thermometers!



NEAT APPEARANCE, distinctive chrome-plated dial ring.

EASY TO READ, modern aluminum dial, large figures.

WIDE VARIETY, dial available in 2", 2½", 3½", 4½", 6", 8½" and 12" diameters with mercury, vapor, gas, solid liquid or bi-metal actuation.

WIDE TEMPERATURE RANGES, available in both Fahrenheit and Centigrade dials, temperature ranges from -100° to 1000° F.

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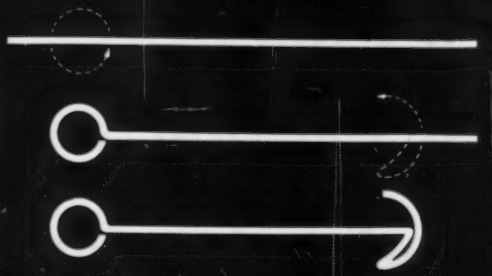
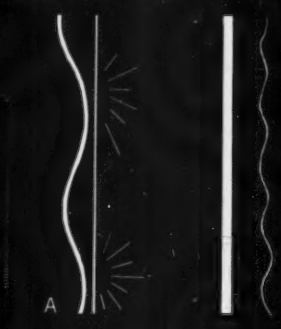
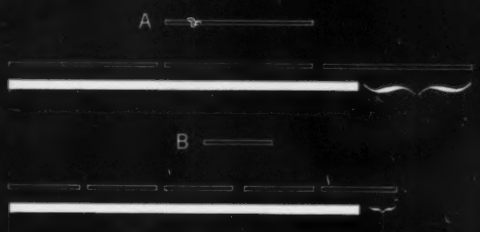
COLLECTING ELECTRODE DESIGN ANOTHER REASON FOR SUPERIOR PERFORMANCE OF BUELL PRECIPITATORS



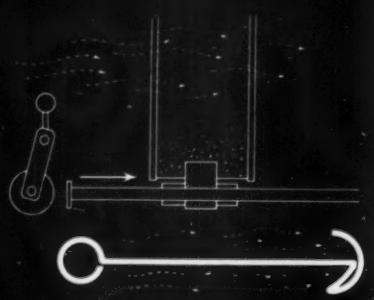
HEAVIEST CONSTRUCTION, ONE-PIECE FABRICATION Rolled, from a single piece, the structural design and thickness of the Buell collecting electrode provides the strength to retain proper shape and alignment in erection and operation.



EASE OF HANDLING AND INSTALLATION – Rugged sections can be installed without bending or distortion thereby eliminating the possibility of 'arc-overs' (A).



OPTIMUM FLEXIBILITY IN DESIGN OF PRECIPITATOR –Standard 16" width (B) allows increase in size of precipitator by smaller increments (not by 3 foot (A) or longer sections). Permits economical sizing of precipitator to specific requirements of efficiency and space.



POSITIVE "SHEARING ACTION" DESIGN – No reentrainment of dust in rapping. Each row of electrodes is rapped separately–in the direction of the gas flow–on a continuous cycle. Dust is sheared off, drops in an agglomerated mass, and pockets on electrodes minimize reentrainment.

Add to this Buell's exclusive baffling system adjustable after installation for uniform distribution of gas flow, sealed insulators, rigid, 4-point suspension of emitting system, and high emittance, minimum maintenance Spiralectrodes and you have a combination that's hard to beat. You'll be glad you decided on Buell precipitators when you experience superior performance and minimum maintenance. Buell Engineering Company, Inc., Dept. 47-E, 123 William Street, New York 38, New York. Northern Blower Division, 6426 Barberton Avenue, Cleveland, Ohio. Electric Precipitators • Cyclones • Bag Collectors • Combination Systems • Fans • Classifiers

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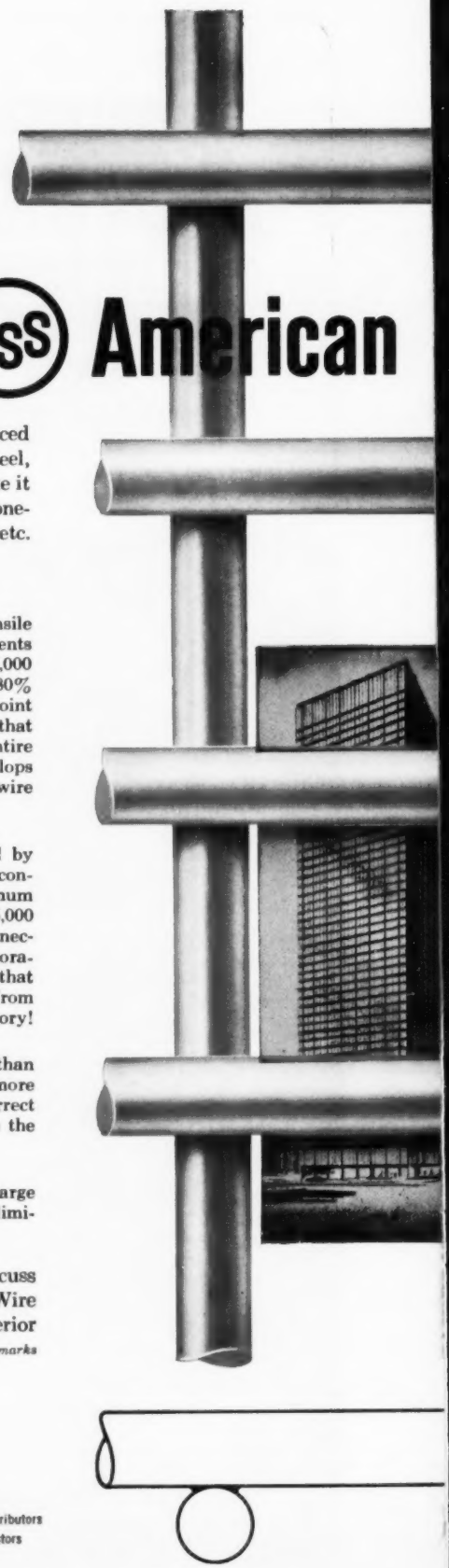
it's big...
it's strong...

extra-heavy ½ inch USS American



Welded Wire Fabric is now available with ½" diameter wires spaced as close as 2" on centers in both directions! These new areas of steel, plus the many time-tested advantages of Welded Wire Fabric, make it the ideal structural reinforcement for all types of construction—one-way slabs, two-way flat plates or flat slabs, walls, slabs on grade, etc.

Consider these advantages:

1. American Welded Wire Fabric is produced from cold-drawn high tensile steel wire. This wire is carefully produced to conform to the requirements of ASTM Specification A82-58T. The minimum tensile strength is 75,000 psi and the minimum yield point, as defined in this specification, is 80% of the tensile or 60,000 psi. Actually, cold-drawn steel wire has no yield point in the conventional sense—no sudden excessive elongation. This means that cold-drawn wire tends to resist stress practically throughout its entire strength range without revealing any sudden elongation such as develops in a typical hot-rolled bar. This physical advantage of cold-drawn wire makes it the ideal concrete reinforcement.

2. American Welded Wire Fabric is completely machine prefabricated by electrically welding all wire intersections. The strength of these welds conforms to ASTM Specification A185-58T which requires that the minimum average shear value of the weld in pounds shall not be less than 35,000 multiplied by the area of the longitudinal wire. This high-strength connection assures positive "mechanical anchorage" in the concrete. In fact, laboratory tests reported in the ACI Proceedings, Vol. 48, April, 1952, show that this anchorage is so good that fantastically high bond stress values from 1000 psi to 2700 psi are computed using conventional bond stress theory!

3. American Welded Wire Fabric is prefabricated with greater accuracy than can normally be relied upon in field work. The wires may not vary more than ¼" center-to-center than the specified spacing. This assures correct placement and distribution of the steel. Also, the wires are drawn to the very close tolerance of 0.003".

4. American Welded Wire Fabric requires very little on-the-job tying. Large prefabricated sheets are shipped to the job and placed as a unit. This eliminates thousands of ties and results in important labor savings.

The representatives of American Steel & Wire will be pleased to discuss with you the many advantages and applications of Welded Wire Fabric. Just contact American Steel & Wire, Dept. 1153 614 Superior Ave., N.W., Cleveland 13, Ohio. *USS and American are registered trademarks*

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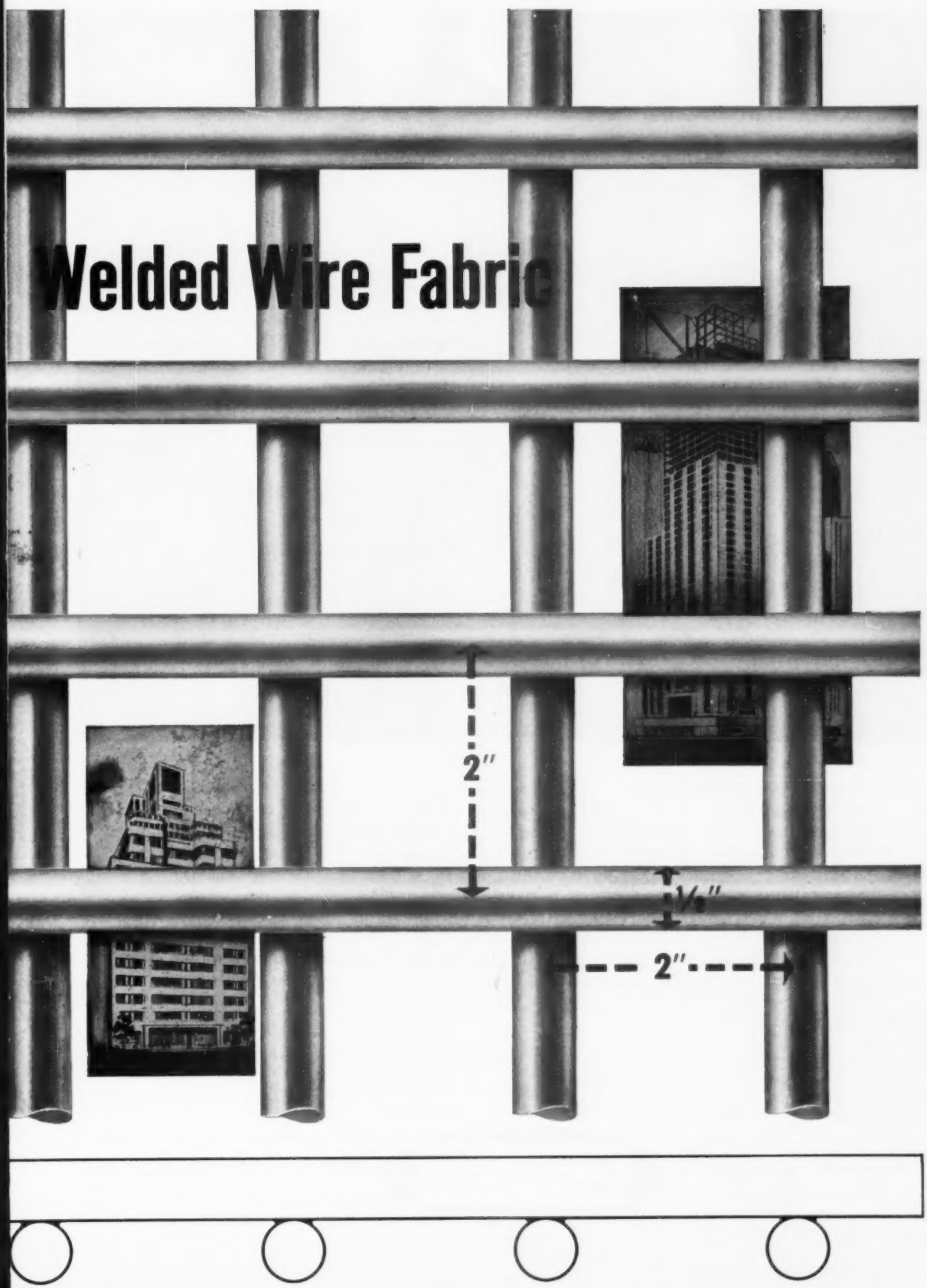
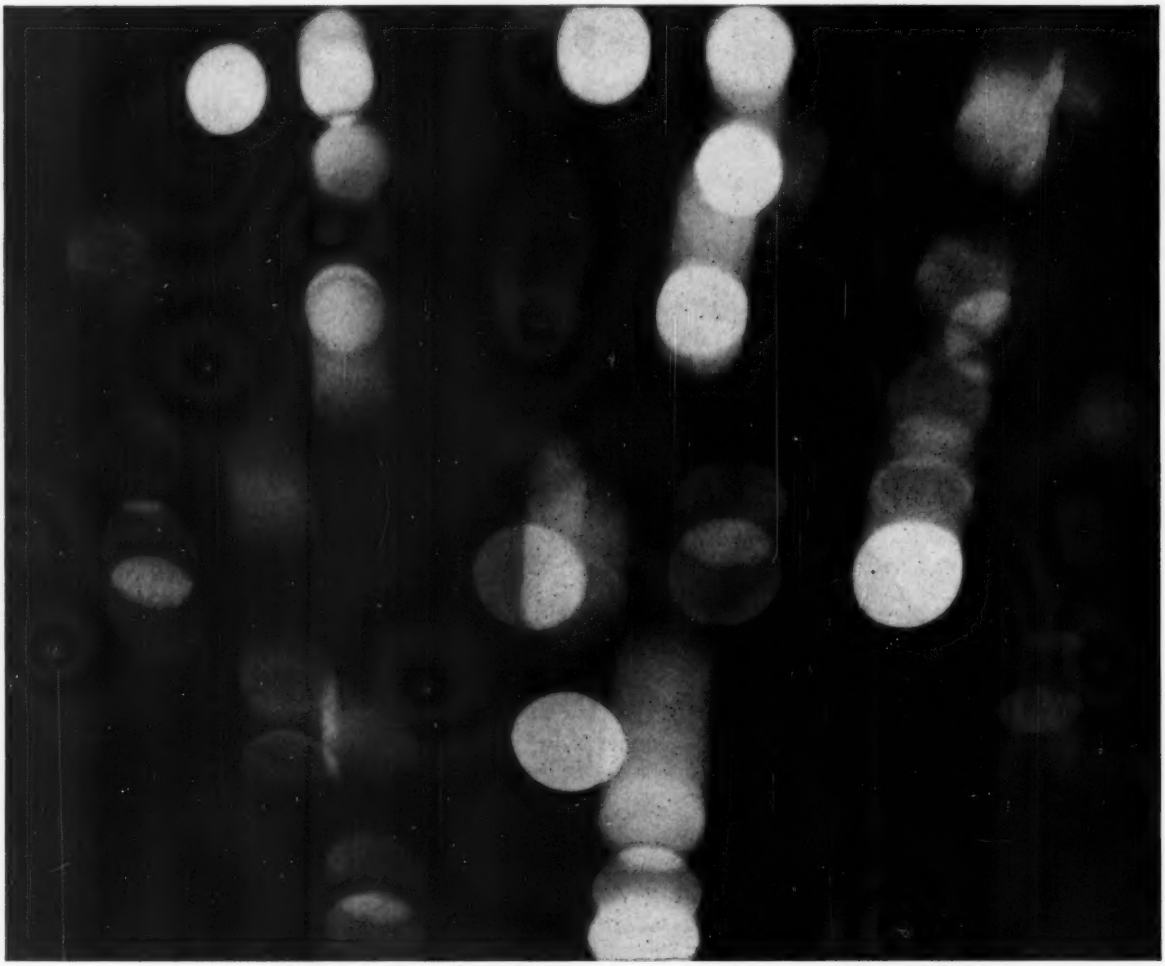

Welded Wire Fabric
2"
1/8"
2"



Corrosion on the Run . . . Cascading over a waterfall or tumbling from the sky, tiny droplets of water absorb gases from the atmosphere. While aerated water is pleasant to the taste and touch, it vigorously corrodes and destroys boiler tubes, industrial piping systems and processing equipment. Effective deaeration is the best answer to the removal of destructive gases such as oxygen and carbon dioxide. ● Over 75 years ago, Cochrane pioneered the first of many developments in this field with the introduction of the direct contact feedwater heater. Today, with the largest number of deaerator installations in the world, Cochrane continues to research and refine this important requirement of modern power and processing plants. This background is your assurance of proper recommendation and performance. In water conditioning . . . the name is Cochrane. Ask for literature on applications and types of deaerators. Write Cochrane Division, Crane Co. 3112 N. 17th Street, Philadelphia 32, Penna.

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Men and Firms

Harold P. King, structural engineer and partner of King, Benioff & Associates, consulting engineers, of Sherman Oaks, California, has been elected president of Consulting Engineers Council. He succeeds Hueston M. Smith of St. Louis, Missouri. Other officers include: Cedric R. Acheson, Syracuse, New York, first vice president; Sanford K. Fosholt, Muscatine, Iowa, second vice president; and George W. Poulsen, Jr., Salt Lake City, Utah, treasurer. George J. Toman, Mandan, North Dakota, was renamed secretary of the Council.

KING

COCHRAN

A. G. Cochran, formerly president of the Clay Sewer Pipe Association, has become a partner in Rackoff Associates, Columbus, Ohio, engineering firm.

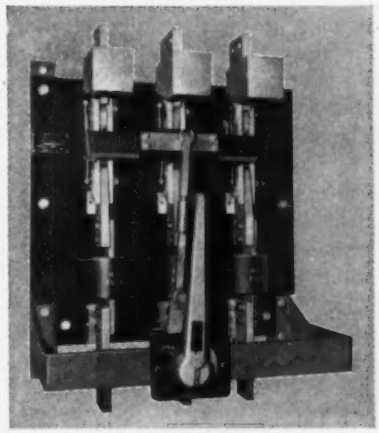
Arthur W. Flynn, formerly manager of development and project engineering of Nuclear Development Corporation of America, has joined Ebasco Services, Inc. as a nuclear engineer. In his new post Flynn will be engaged in the application of nuclear science and engineering in connection with nuclear power plants, test reactors, nuclear research laboratories, and other facilities.

Charles F. Bird and Albert M. Tietzel, civil engineers, Columbus, Ohio, have dissolved their partnership. Bird has formed the firm of Charles F. Bird and Associates, with offices at 656 High Street, Worthington, Ohio, for the practice of consulting civil and municipal engineering and surveying. Chief associate is Richard J. Bull.

New officers of the Civil Engineers and Land Surveyors Association of California are: Edward F. Koenig, president; A. M. Fickes, vice president; and Hugh E. Halderman, secretary-treasurer.

Harland Bartholomew and Associates has announced the opening of a new office at 412 Transportation Building, Washington, D. C.

Burns & McDonnell Engineering Company, consulting engineers, Kansas City, Missouri, has announced the admission of the following former staff members to partnership in the firm: Leo L. Cunningham, Jasper W. Meals, Alwin H. Rector, William W. Rumans, and Edwin J. Runyan. Con-



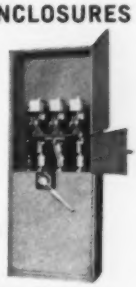
THE NEW
BARKELEW
BOLT-LOC*
LOAD BREAK SERVICE ENTRANCE SWITCH
For 1200 to 4000 Amperes —240-480-600 Volts

Designed for use with HIC fuses for service entrance applications, and with or without fuses, as isolating switches, feeder disconnect or protector switches where cool operation, rugged construction, safety and complete reliability are required. Thoroughly tested for interrupting, short circuits, and load carrying capacity.

- Bolted pressure contacts.
- Quick break mechanism.
- Double slotted steel plate arc quenchers extinguish arc rapidly, usually in less than 1½ cycles.
- Replaceable arcing tips on all switches. Silver-tungsten tips on 480-600 volt switches.
- All parts made to close tolerances for positive operation.
- 14 inch depth to match standard control cabinets.
- Silver contacts and terminals.
- Fusible for: Bussmann KRP Hi-Caps, KTX Limitrons; Chase Shawmut 55H Amp-Traps; G-E Type CLF.

FREE STANDING ENCLOSURES

Available standard enclosures start at 32" wide by 14" deep by 76½" high. Minimum enclosure 30" wide.



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BULLETIN NO. 101

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Electric Switching Equipment Since 1904

tinuing as members of the firm are Robert H. McDonnell, Arthur F. Hartung, Russell G. Kincaid, Hartwell J. Rosson, and Earl J. Thomson.

Officers of the new Hampton Roads Section (embracing 18 Virginia counties) of the American Institute of Electrical Engineers are: Draper D. Smith, Hampton, chairman, and Twyman E. Bowman, Newport News, secretary.

W. Turner Wallis has joined the staff of Gee & Jenson, Consulting Engineers, Inc., Tallahassee, Florida, as special consultant in the field of water resources engineering. Wallis, formerly head of his own consulting practice in West Palm Beach, will specialize in administrative and fiscal aspects of water resources management.

Alf Kolflat, senior partner of Sargent & Lundy, Chicago consulting engineering firm, retired on March 31, 1961, and Frank V. Smith has been named his successor. Kolflat had served as senior partner since 1954. He joined the staff in 1925 and was admitted as a member of the firm in 1938. Smith joined the firm in 1927 and was admitted to the partnership in 1945. He served as chief electrical engineer from 1946 to 1953, and in 1954 was appointed general manager.

SMITH

PRATT

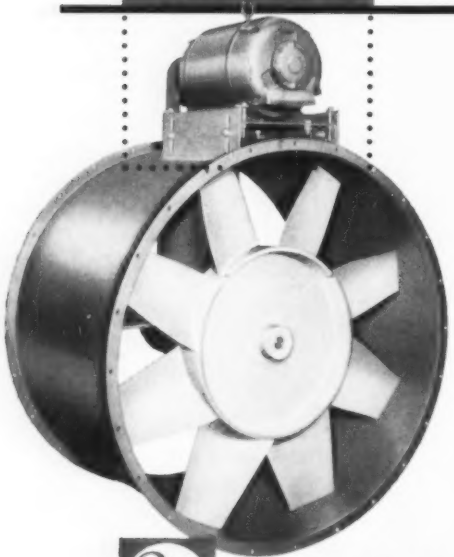
Stanley Engineering Company, consulting engineers, Muscatine, Iowa, announces the appointment to its staff of Harold K. Pratt as chief civil and hydraulic engineer. Pratt, who has had more than 25 years experience in civil engineering work with emphasis on hydraulics, was on the staff of the St. Lawrence River Joint Board of Engineers for two years and, most recently, was project engineer for The Bechtel Corporation.

Lyle E. Marque & Associates, consulting engineers, Spokane, Washington, has moved its offices to North 2319 Monroe Street.

Frank F. Davis has joined Kaiser Engineers International and has been elected vice president – Australasia and the Far East. Davis will direct the company's business activities in that area, with headquarters at Kaiser Center, in Oakland, California.

De Leuw, Cather & Company, consulting engineers with offices in several cities, announces the reorganization of its board of direc-

CHANGE MOTORS ..ANYTIME TO STEP UP CAPACITY!



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PROPELLAIR Type BT Fans, sizes through 60", have universal mounting plates which accommodate motors to 30 HP. All bearing assemblies are sized for 50 HP loads. BT Fans can easily be field-modified to boost or decrease capacity, regardless of original rating, simply by changing the motor and V-belt drive. Use BT Fans for low-cost general duty, for handling corrosive or explosive fumes, extreme heat or high humidity. Straight-line design permits easy, inexpensive installation. A wide range of propeller designs permits selection for maximum efficiency at the operating range involved. Fans bear AMCA Certified Ratings to 84,000 cfm, free air. Write today for Bulletin 625CE

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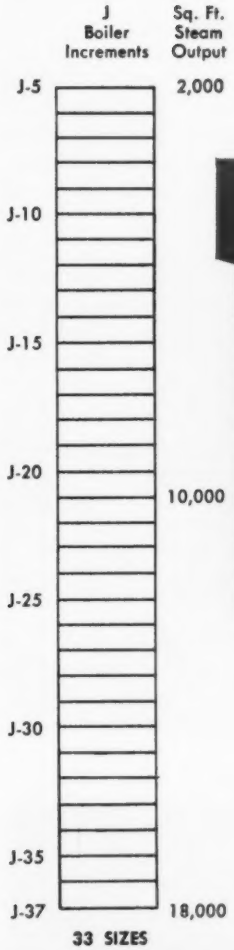


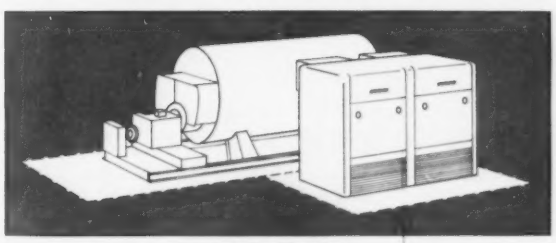
A.G.A. gross output
480,000-4,320,000 BTU per hr.

Send for Bulletin C-297

In Weil-McLain Type "J" Boilers, the flexibility of cast iron sectional construction has permitted the design of a complete line of boilers with sizes increasing in small increments. No need now to increase operating cost and boiler room size because of inability to closely match capacity to load.

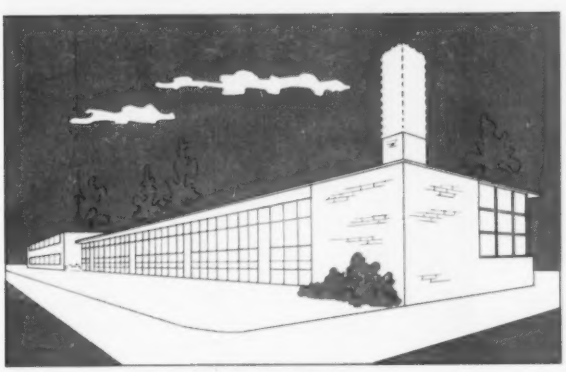
Close sizing is only one of many features offered by Type "J" Boilers. Others include:

1. Made of corrosion-resistant cast iron—with finned sections—internal steam separators—large flow tappings.
2. Ribbon burners assure amazingly quiet operation.
3. A.G.A. approved efficiency of 80%... approved for all gases.
4. Develop full capacity as rated by A.G.A. and I=B=R.
5. Available with A.G.A. approved dual fuel manifold.
6. Electronic controls and pre-wired control panels engineered as part of unit.
7. No refractories, no motors or fans, no tube replacement, no water treatment.
8. Fully insulated with foil-backed fibreglass.
9. All surfaces easily accessible for cleaning.



SAVES SPACE

Sketch shows the space saved by a 60 H.P. Type "J" Boiler over a typical scotch marine boiler of comparable rating. It is approximately one half as long, one foot less in height and only a few inches greater in depth, including space necessary for the draft hood. The required service area is smaller... and appreciably smaller if tube replacement is to be made through the rear door of the scotch marine boiler.



SAVES A CHIMNEY

A high chimney, forced draft or induced draft are not necessary for the proper operation of the "J" Boiler. All "J" Boilers can operate with a vent.

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MICHIGAN CITY, INDIANA

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tors as follows: C. E. De Leuw, president; L. H. Cather, executive vice president; R. H. Anderson, vice president; J. E. Linden, vice president; W. R. McConochie, vice president; R. B. Richards, vice president; and V. E. Staff, vice president. The growing activities of the company was given as the reason for the change.

New address announced by Scott Whitnah Consulting Engineer Inc. is Room 456 Builders Exchange, 609 Second Avenue, South, Minneapolis, Minnesota.

Hunter Hughes, formerly editor of CONSULTING ENGINEER magazine, has been named managing director of American Engineering Consultants Incorporated, a consortium made up of seven American consulting engineering firms seeking foreign work. The participating firms are: Dufill Associates, Inc., Boston; Toman Engineering Company, Mandan, North Dakota; Bosch & LaTour, Cincinnati; Ketchum, Konkel & Hastings, Denver; Dames & Moore, San Francisco; Raphael Katzen, D.Ch.E., Cincinnati; and Wilbur Smith & Associates, Columbia, South Carolina. Hughes, just back from a trip around the world, will be located in Washington, D. C.

New address of Johannessen & Girand is 6601 North Black Canyon Highway, Phoenix, Arizona.

G. Frank Gardner has been named to a newly-created position of manager, systems and procedures, by The Rust Engineering Company, of Pittsburgh and Birmingham.

Crawford, Murphy & Tilly, consulting engineers, Springfield, Illinois, has announced the appointment of four employees as associates of the firm. Reorganization of the firm structure followed the recent retirement of Ray V. Tilly, former partner. The new associates are: Charles L. Ritchie, Donald E. Thompson, Carl A. Wieland, and Elmer E. Young.

Paul E. Feucht, formerly Deputy Assistant Secretary of the U. S. Army (Logistics), has been named railway division director of Transportation Consultants, Inc., of Washington, D. C.

Philip H. Sayre, formerly senior systems engineer with Hoffman Electronics Corporation, has been appointed a senior consultant with Marc Shiowitz and Associates, Inc., computer consultants and engineers. Sayre will be working on studies relating to radar systems, tropospheric scatter and other communications systems, missile guidance, ballistic missile defense, and intelligence systems.

August W. Compton, formerly vice president of Clyde E. Williams and Associates, Inc., Indianapolis consulting firm, has been elected presi-

SOUND SOLUTION TO A SOUND PROBLEM:

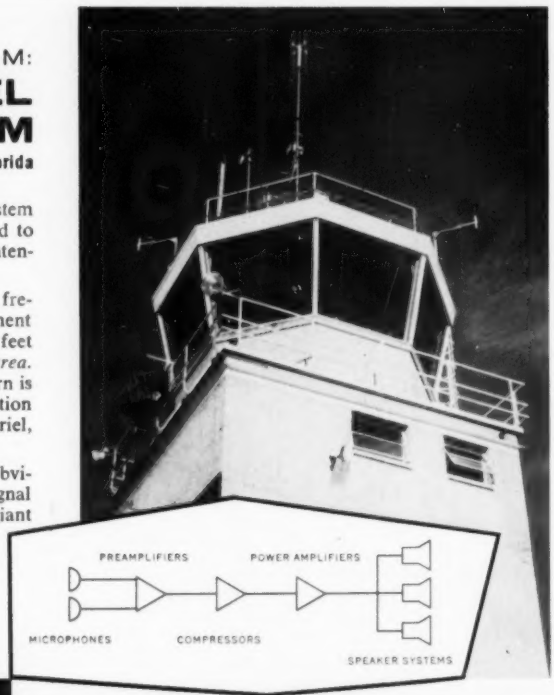
ALTEC HIGH LEVEL VOICE COMMAND SYSTEM

Specified for Navy Jet Training Base, Sherman Field, Pensacola, Florida

SOUND PROBLEM: An effective, failure-proof paging and alert system was required for field-wide ground control. The system selected had to provide absolute message clarity capable of overcoming the high intensity noise levels generated by the blast of jet engines.

SOUND SOLUTION BY ALTEC: ALTEC multicell horns and voice frequency drivers with associated ALTEC power and control equipment were selected. With ALTEC, flight line paging is effective 500 to 700 feet in front of each horn *during jet engine blasts in the adjacent taxi area.* At all other times, and with aircraft in the vicinity, each ALTEC horn is audible at 1,000 yards. In this critical application, where no malfunction is minor and garbling could result in disaster to men and materiel, ALTEC is relied on to perform as specified.

LET ALTEC HELP SOLVE YOUR SOUND PROBLEM: Because of obvious greater superiority over conventional siren and other coded signal systems, the OCDM authorities of Salina, Kansas, selected a giant ALTEC voice warning system to blanket that prime target area. High level ALTEC voice command and warning systems are equally effective in many other critical military and civilian applications such as airfields, missile sites, firing ranges, general disaster control, and air defense facilities.



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CHECK YOUR SUSPENSION SYSTEM I.Q.

How many of these important applications can you identify?

Suspension systems today come in all sizes... in all types.

They support pipelines, conveyors and power transmission lines. As tramways they help load ships, haul timber, and carry ore. Suspension systems have opened up whole new vistas of imaginative engineering and architecture through column-free suspended roofs.

Suspension systems extend over famous rivers throughout the world. They *also* span gulleys on golf courses, and cross wide ravines. They save time as walkways between the upper floors of factories.

Roebling was first in the cable suspension field, and today offers unmatched materials and facilities for any suspension project. Write now for our free informative book "Bridge Division Products and Engineering Services." And for a prompt reply to *any* suspension query, contact Roebling's Bridge Division, Trenton 2, N. J.

Answers to Quiz:

1) *Conveyor Bridge at Pasco, Washington,* 2) *Gymnasium with suspended roof at Central Washington College of Education, Ellensburg, Washington,* 3) *Cable-stiffened suspension San Marcos Bridge, El Salvador,* 4) *1619-ft TV Tower at Portland, Maine,* 5) *Mt. Sunapee Chairlift,* 6) *Pipeline Suspension Bridge, Blythe, Cal.,* 7) *Footbridge with prestressed concrete floor, Lumberville, Pa.*

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John A. Roebling's Sons Division
The Colorado Fuel and Iron Corp.

dent of Leigh Fisher Associates, Inc., airport consulting firm, of San Francisco. Compton's election was made known by Leigh Fisher, the firm's founder and president since 1946. Announced at the same time was the change in the firm name, formerly Leigh Fisher & Associates, and its incorporation as Leigh Fisher Associates, Inc.

E. Roger Hewitt was elected president of the Consulting Engineers Association of Michigan at its recent conference in Lansing. He succeeds John W. Cushing. Also elected were: vice president, Robert H. Gove; treasurer, T. C. Williams; secretary, Ralph W. Petrie; director, Kenneth B. Fishbeck. Incumbent directors are Arthur W. Gillespie and Karol R. Piotrowski.

James A. Cummins, head of the consulting engineering firm of Robert J. Cummins Company, has been named Outstanding Young Man for 1960, by the Houston Chamber of Commerce. Cummins, a director of the Houston Engineering and Scientific Society and a member of the American Society of Civil Engineers, was chosen from candidates submitted by Houston business and civic leaders.

CUMMINS

BURNS

Bennett W. Burns announces the opening of offices for the practice of civil, structural, and mechanical engineering, at 1537 Tennessee Building, Houston, Texas. Burns formerly was managing partner of the Houston office of H. E. Bovay, Jr., Consulting Engineers.

The firm name of Sverdrup & Parcel Engineering Company, St. Louis, has been changed to Sverdrup & Parcel and Associates, Inc., to indicate more clearly the nature of the organization, which provides architectural as well as engineering services, and to recognize the engineers and architects who are an integral part of the firm.

W. H. Buchhagen, president of Bucknell Engineering Company, Pittsburgh, has been elected a member of the board of directors of Consulting Engineers Council.

The Texas Society of Professional Engineers, at its recent annual meeting, in Abilene, installed Nat P. Turner as Region #4 vice president. Turner is president of Turner and Collie Consulting Engineers, Inc., Houston, which recently announced the election of Robert E. L. Johnson as vice president and Robert S. Braden as vice president and secretary. ▲▲

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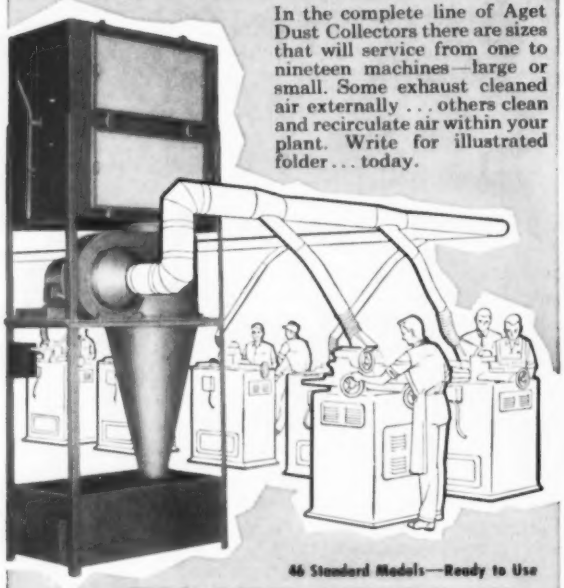

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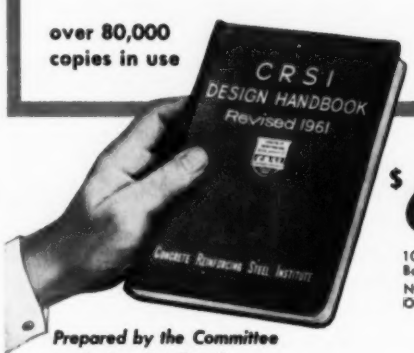

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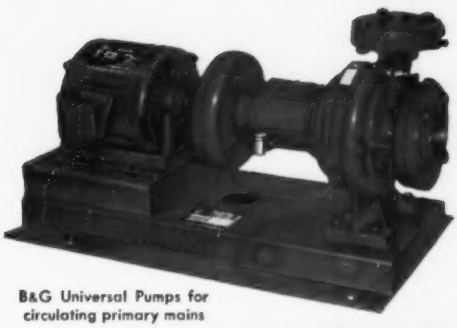
ALL PROVIDED BY A B&G *Hydro-Flo* SYSTEM



B&G Universal Pumps for circulating primary mains

B&G Booster and PD Booster Pumps supply individual ZONES

B&G Monoflo Fitting

Stapleton Houses, Staten Island, N. Y.
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Architects: Ballard, Todd and Snibbe
Mechanical Engineers: Carlson & Sweatt
Mechanical Contractor: H. Sand & Co.

This example of contemporary mass housing employs *hydronic* heating at its versatile, economical best. Space heating, domestic water heating and snow melting are all effected by means of circulated hot water. *Primary and secondary pumping*, as conceived and developed by B&G engineers, makes possible this triple-function system.

Where multiple buildings or multiple zones are to be heated with circulated water, this pumping method materially reduces the pump horsepower required, improves heat control and saves fuel.

This installation is basically a two-zone primary distribution system with 3 secondary heating zones, 1 secondary domestic water zone and 1 secondary snow melting zone in each building. The space heating risers are of the B&G up-and-down Monoflo type, using 3,303 Monoflo Fittings.

Write for free booklet which gives detailed information on this more efficient, more economical method of heating with water.

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Day-Brite PARAFLO® Troffers with patented PARALOUVERS® simplify ceiling appearance and planning by eliminating the need for separate air diffusers . . . deliver 100 footcandles with a minimum of glare. PARAFLO Patent Nos. 2,845,854 - 2,845,855 - 572,565 - 575,897 PARALOUVER Patent Nos. 26,833,799 - 507,541

Sleek fixture appearance complements modern wall treatment throughout building.

Pure Oil Company Building, Palatine, Illinois
Architect: *Perkins & Wills;* Electrical Contractor: *Kelso Burnett Co.*

Who goofed and forgot the air diffusers?

Nobody goofed.

In fact, very *special* attention was given to assure Pure Oil Co. employees the finest in year 'round comfort. Day-Brite combination lighting-air diffusing fixtures deliver lighting, cooling, heating and ventilation — all through the same outlet.

The result is an attractive, efficient working environment with...

High-level, low-glare Day-Brite lighting for better vision;

More uniform air distribution, thanks to the many diffusing sources;

And clean, uncluttered ceiling appearance.

A full year was spent pre-testing these Day-Brite fixtures from every possible angle, including ease of installation and maintenance. Now in operation, Pure Oil Co. engineers report "complete satisfaction!"

For more information on how Day-Brite combination lighting-air diffusing fixtures can simplify your next ceiling plan, contact your Day-Brite representative listed in the Yellow Pages or write *Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis, Mo., and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.*

Write for FREE booklet on **Comfort Conditioning with Light and Air:** Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis 15, Mo.

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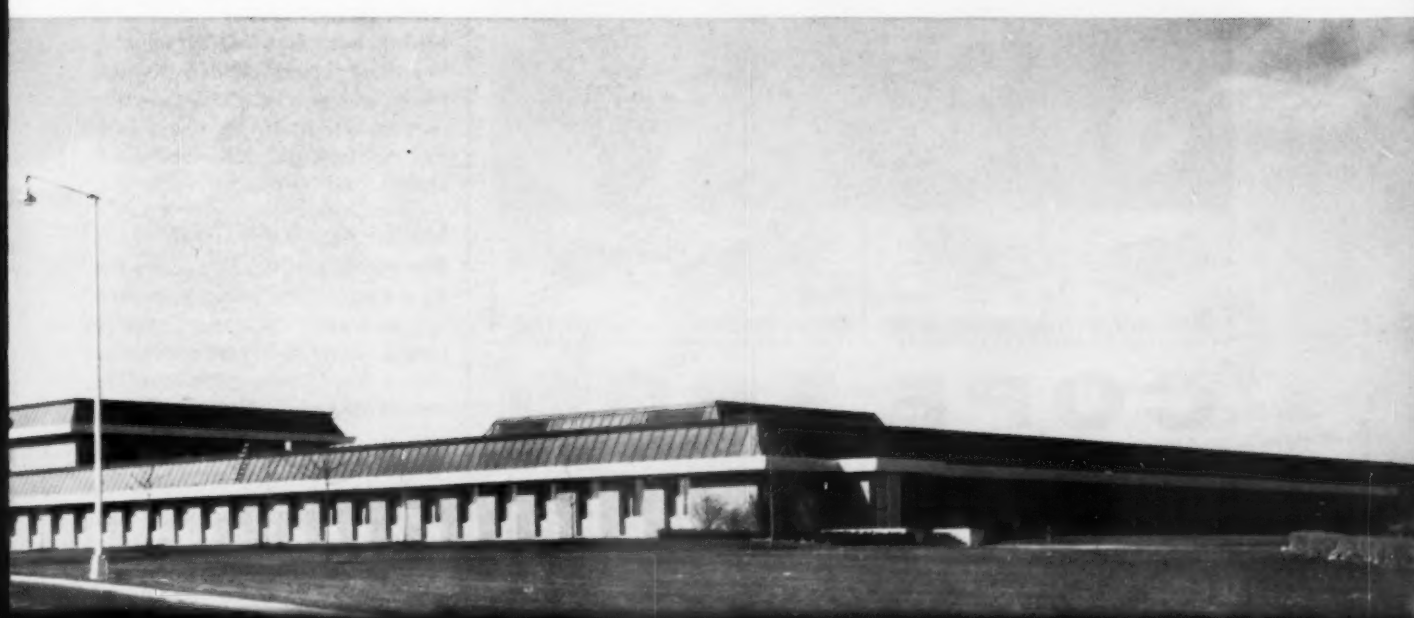

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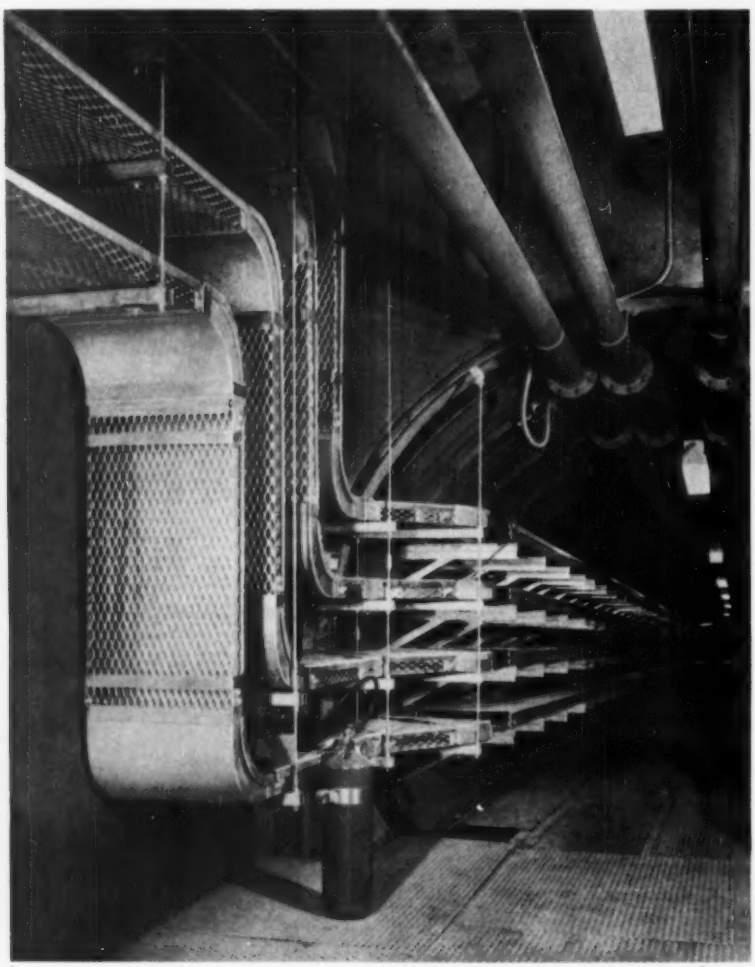
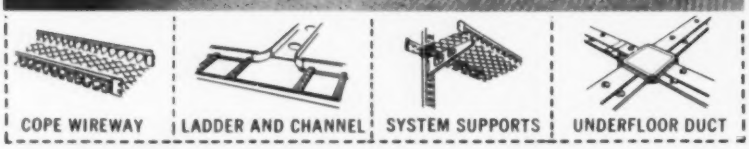
For easy cable inspection . . . for re-routing . . . for future system expansion . . . power and control cables laid in Cope Wireway are easy to get at . . . always easy to work with. More and more engineers are specifying lightweight, easy-to-install Cope cable supporting systems to reduce maintenance as well as initial costs. Additional cables can be laid quickly, easily, in existing Cope Wireway or Ladder systems without costly reconstruction.

A Cope installation stays "up-to-date" for years to come. Talk to your Cope man about the complete line of Cope cable supporting systems for every cable distribution requirement—or write direct for detailed data. SOLD ONLY THROUGH AUTHORIZED ELECTRICAL WHOLESALERS.





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A CHOICE OF WIRE AND CABLE SUPPORTING SYSTEMS

Ohio and Michigan Registration

The case of Modern Engineering Co. vs General Electric has been settled out of court, leaving Michigan and Ohio with officially unconstitutional registration laws for architects, engineers, and surveyors. Earlier, a Court of Appeals had declined to review the case. Thus, it became necessary to amend the Michigan law, and that process now is under way. There is every indication that the amendment will pass through the legislature quickly and uneventfully.

The original argument was over a contract between the two parties, under which Modern Engineering agreed to design, manufacture, install, test, and place in operation a system of automation for a fabricated stator blade line at General Electric's plant in Evendale, Ohio. Modern Engineering personnel are not registered under either the Michigan or the Ohio engineering laws, and they contended that this made no difference, because the laws of both states were unconstitutional and invalid. The court agreed, and so ruled.

Legislation — South Dakota

The governor of South Dakota has signed into law a measure permitting consulting engineers to design bridges and other structures on county highway systems in the state. This repeals a 1939 law which

The High Spots

had prevented consulting engineers from participating in anything other than the design of actual roadways for the state.

The Consulting Engineers Association of South Dakota, a member of CEC, made repeated attempts to have the law changed. It had to fight not only the full-time lobbying of state engineering departments, who were afraid of losing the work, but also the extremely crowded legislative calendar.

This year's successful fight to have the South Dakota law changed was led by CEASD President Julian Staven. Winning this 22-year battle proves that if consultants are to influence legislation, they must be persistent as well as right.

More Recognition

Issue number 58 of the *Coal Marketing News* leads with an article about consulting engineers, explaining the advantages of using consultants for industrial power plants. The article ends with the advice that small plant operators should take advantage of consultants' knowledge to cut operating costs. Some of the other comments:

¶ "For maximum benefit, the services of a consulting engineer should properly begin in the planning and specification stage of any project.

¶ "The consulting engineer really excels as a money saver.

¶ "On existing plants . . . a consulting engineer . . . can uncover

CHOOSE THE COPE SYSTEM FOR YOUR SITUATION

Conventional slab floor construction? Cope Standard Underfloor Duct is shallower . . . requires less concrete for installation. Wiring a problem? Specify 7¼" wide Double-Capacity Underfloor Duct—same shallow depth, but greater capacity to handle more power and telephone wiring! Cellular floor construction? Cope Headerduct offers a fully coordinated system for feeding wire from the "headers" into cellular steel decking—simplifying distribution to any floor area.

Qualified Cope field specialists are prepared to assist in every phase of system design and layout with Cope Underfloor Duct Systems. Get to know your Cope man—also write direct for detailed catalog data. FORMERLY SPANG—NOW MADE BY COPE, THE LEADING MANUFACTURERS OF CABLE SUPPORTING SYSTEMS.

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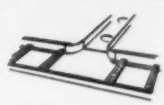
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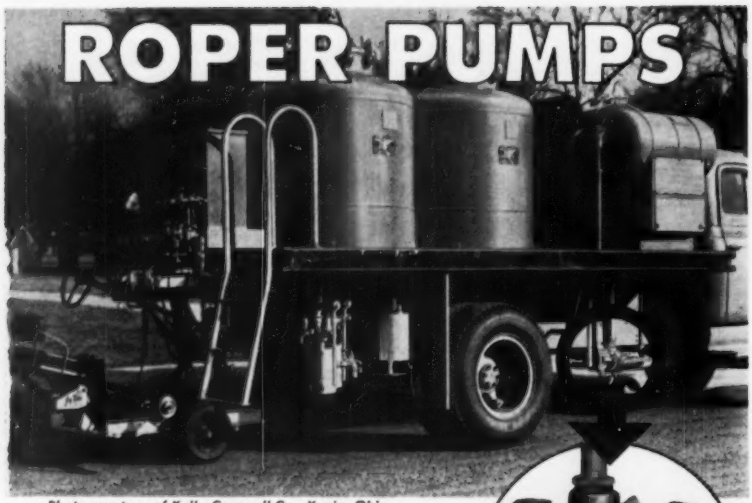

Photo courtesy of Kelly-Creswell Co., Xenia, Ohio

transfer paint from drums to pressure tanks on highway marking machine

• CAPACITY: 40-300 GPM • PRESSURE: 100 PSI

Roper Series 3600 pumps have been a dependable part of Kelly-Creswell highway zone marking machines for many years. The Series 3600 HBZRV-2A model transfers paint mixture from drums to pressure tanks, delivering trouble-free, low-maintenance service, even when handling light-reflective paint containing highly abrasive granules. Roper tank truck pumps are compact, complete units, built with drive shafts on upper or lower gears, depending on type of mountings to be used. Built-in steam chests are available. Series 3600 pumps are specified by many manufacturers of original equipment for the petroleum, process, packaging, and chemical industries for dependable service in handling a wide variety of liquids—thick or thin—under all kinds of industrial conditions.

GEARED TO THE ROUGHEST USE

- **TWO** equal sized, heat-hardened alloy helical gears are the only moving parts. Perfectly balanced construction, accurate machining, provide vibration-free service.
- **FOUR** heavy-duty, high-lead bronze or chrome-iron bearings, hardened for long service, support pumping gears.
- **PRECISION-GROUND** steel shafts are induction hardened at bearing and packing surfaces. Special shaft lengths are available to fit your equipment requirements.

For information about how Roper pumps can serve your equipment, contact your Roper dealer.

Send for "How to Solve Pumping Problems" booklet

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Dependable pumps since 1857

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waste due to inefficient operation; and he can detect conditions that are dangerous to life and property in time to save management from such expenditures."

Highway Lighting

The American Road Builders' Association Committee on Highway Illumination has released the findings of recent surveys, which show definite advantages for highway lighting programs. Committee chairman H. A. Friede said that studies in Connecticut have shown that lighting reduces night accidents by 60 percent in urban areas and by 85 percent on rural highways. Friede indicated that costs can be determined on a basis of $5213 for a fatal injury accident; $1277 for a nonfatal injury accident; and $299 for a property damage accident. A 60 to 85 percent cut in the number of these accidents would more than pay for highway lighting, according to ARBA.

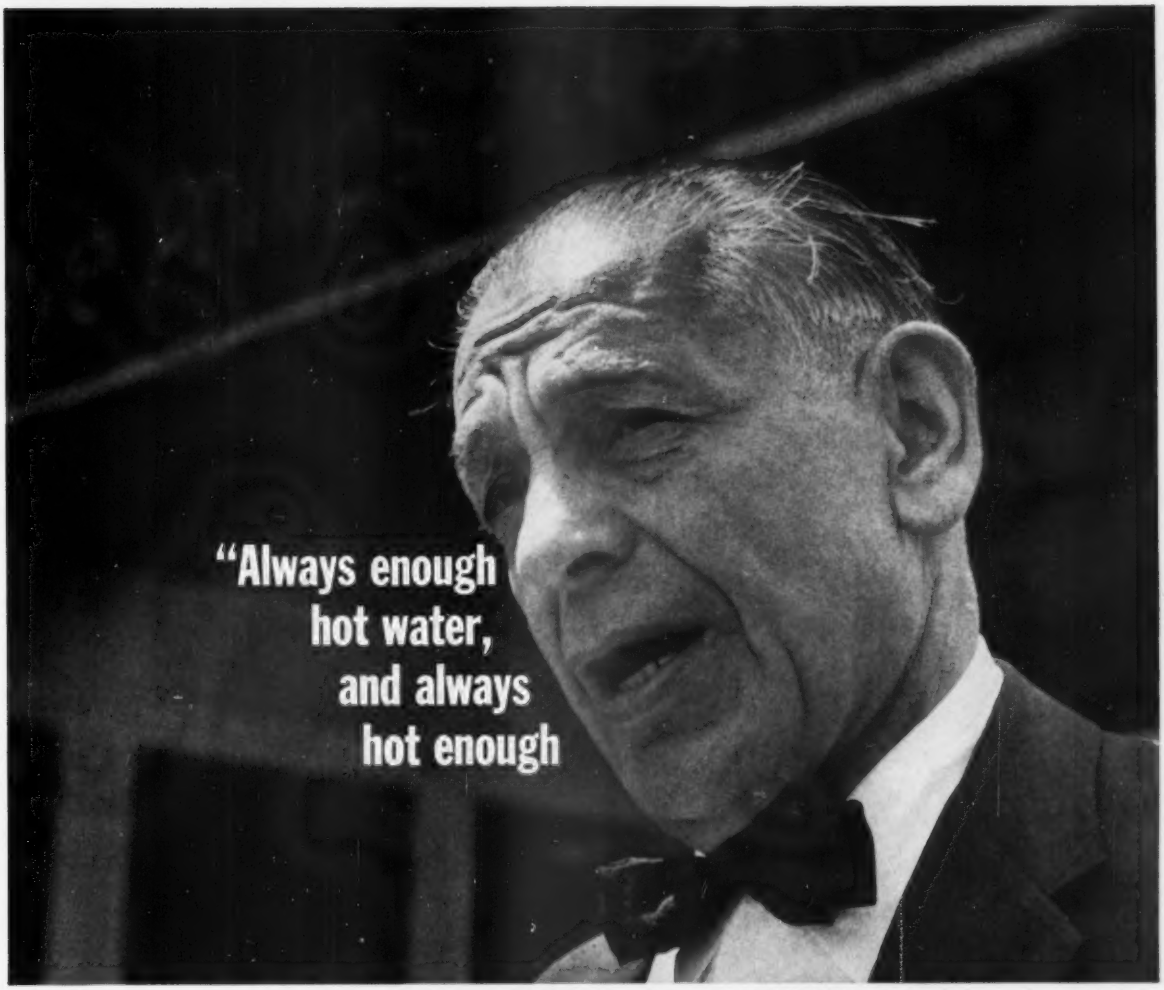
Near-East Traffic Problems

The City of Beirut, Lebanon is developing a crash program for the construction of expressways, subways, and parking facilities, to avoid what the city's chief engineer terms "total asphyxiation." Lebanon, with a population of only 1.5 million, already has 50,000 cars — proportionally more than any other Asian country except Israel. The vast majority of these cars are concentrated in the capital, whose narrow, twisting streets were laid out in the days of the Ottoman Empire.

Beirut is trying to get a loan of $22.5 million to finance the first part of the new highway program. The chief obstacle facing the highway designers is the cost of land. Property values have risen steadily in the country for the past 15 years, and the government will have to pay dearly for every foot of highway built.

Wooing Engineers

Recent studies by the American Management Association and sev-



. . . thanks to GAS and our BURKAY water heater"

Mr. Joseph Freid, co-owner of Steve Phillips Restaurant in Yonkers, N.Y., says, "We marvel at the efficiency, economy and accuracy of the Burkay hot water system we selected for our restaurant. We serve an average of 300 meals daily, and our dishwasher must operate over extended periods. Thanks to our Burkay Gas-fired water heater, we always have the required hot water at the *right* temperature."

It doesn't pay to take chances on a water heater. The extra demands imposed by heavy commercial usage call for a water heater *designed and built* for the commercial field.

The glass-lined storage tank and the copper construction of the new gas-fired Burkay permits use under any water conditions in any city. They may also be installed for a 2-temperature operation... teamed with an A. O. Smith glass-lined storage tank ... installed in multiple, if desired... and used for general-purpose hot water or as a booster heater.

Check the facts and you'll see that modern gas water heaters outperform all others. For specific details call your local Gas Company's water heating specialist, or write to the A. O. Smith Corporation, Permaglas Division, Kankakee, Illinois.
American Gas Association.

This typical installation includes three Burkay Model 718 gas-fired water heaters operating in conjunction with a Permaglas storage tank.

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WHEREVER GASES ARE
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AIRCRAFT EQUIPMENT • Advanced electro-mechanical equipment for the aircraft, missile and nuclear industries.
AEROTHERM • Aircraft lounges, passenger and crew seating.

eral universities have bolstered the often-expressed opinion that the major difficulties most firms have in hiring engineers is a result of their slip-shod recruiting tactics on the nation's campuses. (See page 134, February 1961 CONSULTING ENGINEER.)

The AMA questioned nearly 300 major companies and 140 college placement officers; studies by the colleges included placement officers and student engineers. The results showed that recruitment officials for many companies were discourteous, inefficient, uninformed, uninterested, unqualified, or just plain stupid. The companies that have imaginative recruitment programs handled by competent personnel are the ones that hire the top engineers.

Let the Public Know

John G. Reutter, president of the New Jersey Association of Consulting Engineers, has announced that his organization's primary job in the coming year will be to acquaint the public with the services and advantages offered by consulting engineers. The local program in New Jersey will be patterned after the national program adopted by CEC, and will be directed by a professional public relations consultant.

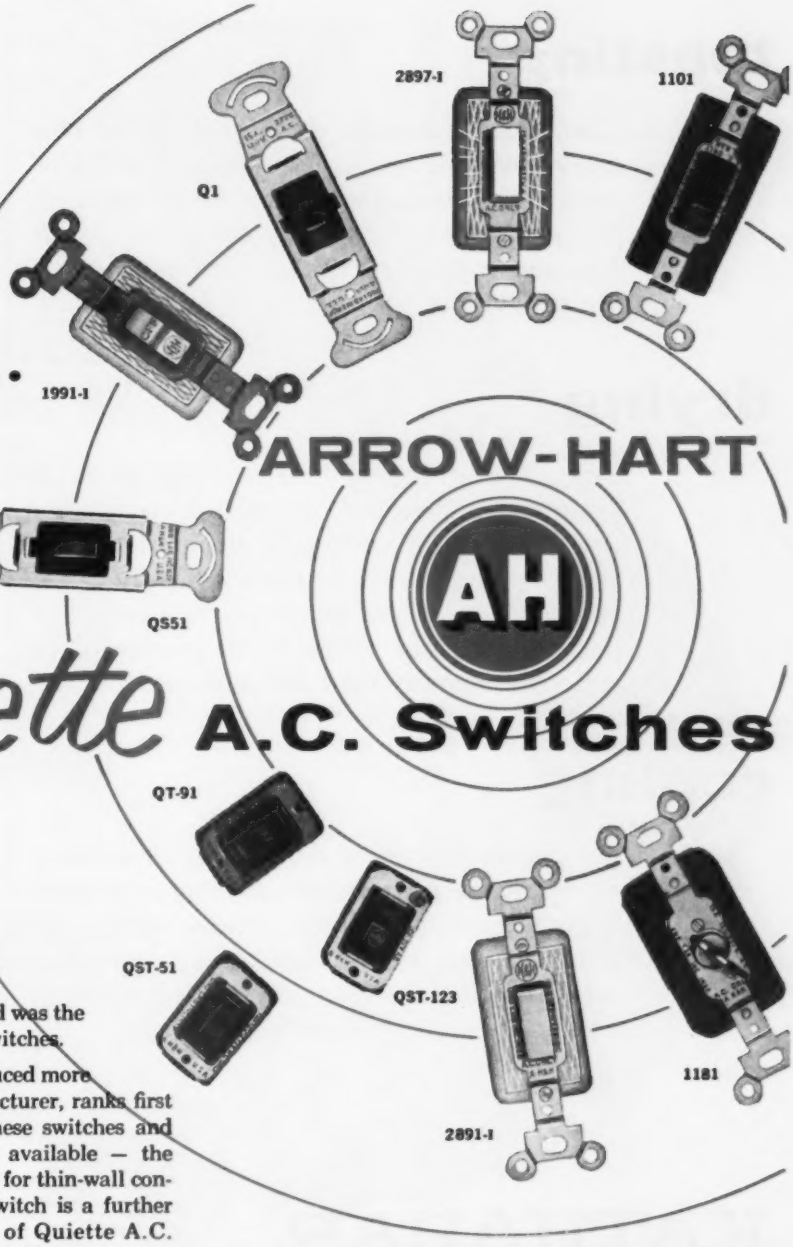
Space Simulator

The General Electric Company is constructing a huge research facility at Valley Forge, Pennsylvania, to study simulated conditions in space and on other planets. The new laboratory, being built at a cost of $6 million, will be used to test actual space vehicles under extreme conditions of heat, pressure, and light. The Boston consulting firm of Jackson and Moreland, Inc., designed the facility, which will be complete in 1962.

Faraday Medal

Doctor Julius A. Stratton, president of the Massachusetts Institute of Technology, has been awarded the

a family of Quality...



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Today . . . Arrow-Hart, having introduced more quiet switches than any other manufacturer, ranks first in the design and development of these switches and now offers the most modern switch available — the Space-Saver Quiette Switch. Designed for thin-wall construction, the Space-Saver Quiette Switch is a further addition to Arrow-Hart's full line of Quiette A.C. Switches — the most complete line available!

Whatever your specifications, there's a member of the Arrow-Hart Quiette Switch family engineered for the application.

Write for your copy of the new folder, "The Complete Quiette Switch Line," Form No. 327-G1371 to The Arrow-Hart & Hegeman Electric Company, Dept. CE, 103 Hawthorn Street, Hartford 6, Conn.

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Quality since 1890

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Continuous, automatic drying with air at precisely controlled temperatures up to 1000°F (for example, continuous toasting of cereal and other food products) is one of many processes in which Kathabar engineers are unusually experienced in the handling of both the air and the product.

drying

Continuous drying of heat-sensitive products (glue and gelatin, for example) is readily accomplished with Kathabar® equipment, using very dry air to remove moisture rapidly under precise control. Kathabar systems reduce cooling requirements, end condensation problems, operate continuously with low maintenance.

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Continuous delivery of sub-freezing air down to extremely low temperatures, without frost or recycling, is one of Kathabar's unique capabilities, whether the air is for storage, testing, or processing. Data on Kathabar equipment for toasting, drying, or cooling is available promptly.

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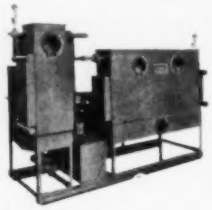

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name & title .....

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Faraday Medal by the Council of the Institution of Electrical Engineers in London.

Doctor Stratton started at MIT in 1924 as a research associate, rising to assistant professor, professor, vice president, chancellor, and, in 1959, president of the University. His outstanding technical work has been in the theory of transmission line, and waveguide and antenna systems for radar. In addition, he has been instrumental in formulating the rigorous and comprehensive courses at MIT.

The Faraday Medal was awarded Doctor Stratton for his contributions to the fields of technological education and research in radio communications. This is only the 39th time in history that the medal has been awarded.

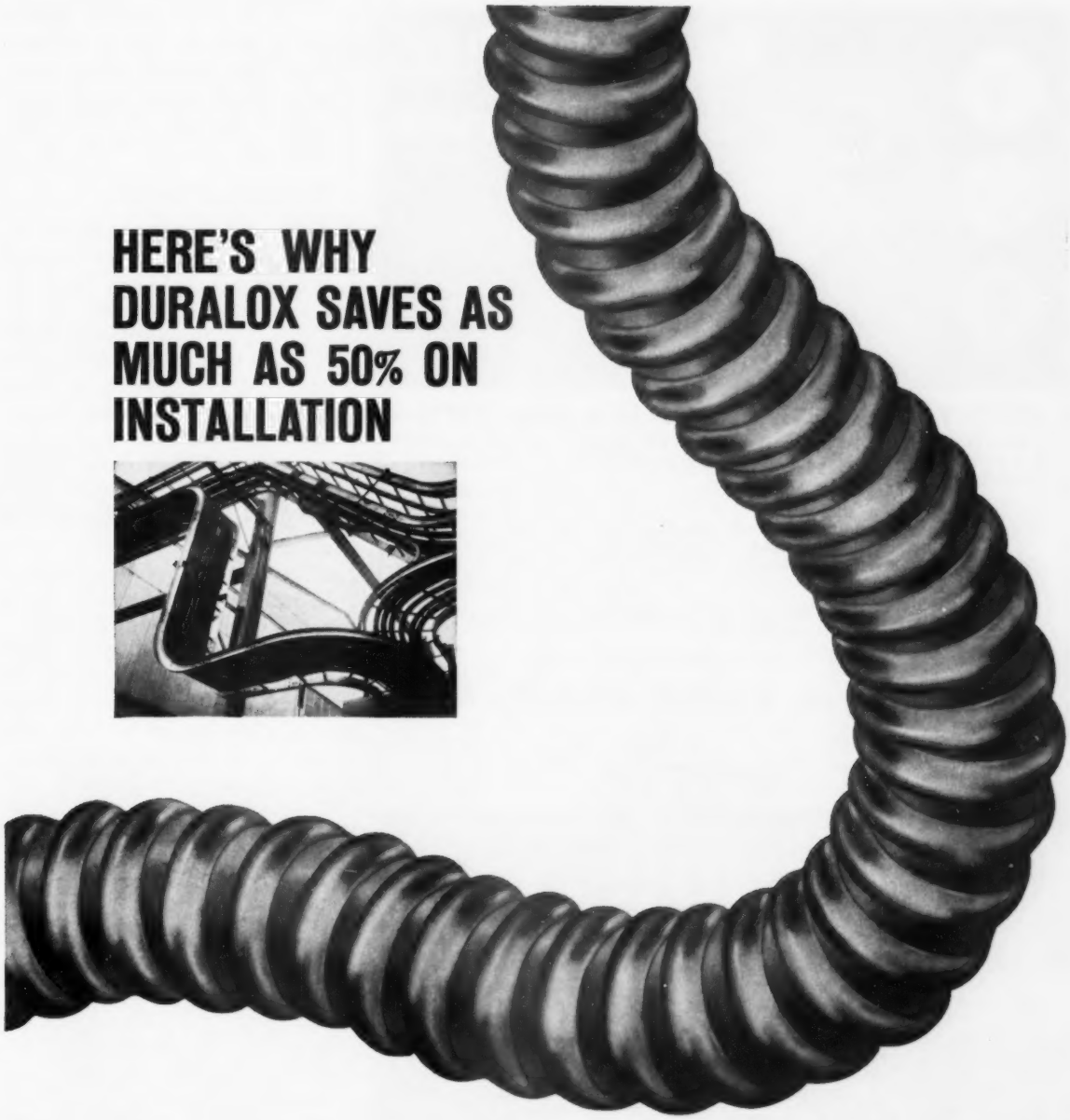
Technical Digest Service

A new research data firm, Technical Aid Service, of Columbus, Ohio, is offering a technical abstracting service especially suited to research and development staffs. TAS, with access to well over 100,000 technical books, plus the facilities of the Library of Congress, will undertake a study of all available literature on a particular subject. Then, TAS writers select only the portion of the literature applicable to their client's needs, and presents this in digest form. The service is said to save a great deal of time and trouble for research and development personnel, especially in freeing them from having to read through long passages of nonessential information.

New Psychrometric Chart

The Trane Company has developed a new psychrometric chart, which, the company says, will provide information adequate to solve all air conditioning problems without reference to auxiliary material. The chart is based on the latest data published by the American Society of Heating, Refrigerating and Air Conditioning Engineers. The only implement needed to read the chart is a straightedge, and

HERE'S WHY DURALOX SAVES AS MUCH AS 50% ON INSTALLATION



Clients save time . . . save money . . . save manpower —with Anaconda butyl-insulated Duralox.* *For Duralox has its own conduit of durable, yet flexible, metallic armor.*

This means fast and easy installation in long runs over and around obstructions, in trays, indoors or out—and all without the expense, trouble and time of laying rigid conduit and pulling cable through it.

Duralox will fit into their long-range plans as well—because it's 100% salvageable and can be readily moved as their plant layout changes.

Duralox's lower reactance—because of the close spacing of the conductors—results in reduced voltage drop and more efficient power distribution. Available in ratings of 5 kv, 15 kv, and higher, in addition to lower voltage ratings.

Whether your problem is specifying wiring for a new plant or rewiring an old one—see the Man from Anaconda. Duralox is just one of the many types of Anaconda wire and cable that can help you increase plant flexibility . . . reduce operating costs . . . bring in new power for both today and tomorrow. For full information write for Bulletin DM-5606 to: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York, Department EFL-1-CE.

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Duralox has Anaconda Butyl (AB) rubber insulation
for • extra-high resistance against ozone
• exceptional moisture resistance
• 22% more current-carrying capacity
than 70° centigrade insulation

SEE THE MAN FROM
ANACONDA®
FOR BUTYL-INSULATED
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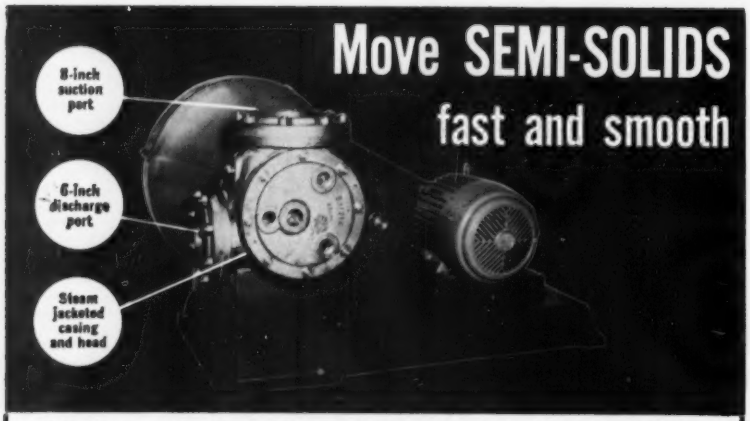

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Moving thick, viscous materials is routine work for this Viking Pump because it's made to do that job. Vikings are built to cut costs and do jobs better. For example, like the unit shown above . . .

- **The pump is all bronze.**
- **It has an 8" suction and a 6" discharge.**
- **It has a steam jacketed casing and head.**
- **It delivers a corrosive thick material of 350,000 S.S.U. viscosity, at 50 G.P.M. against 150 P.S.I.**

You may be surprised, surely you'll be pleased to learn how easily Viking Pumps can handle semi-solids for you.

Send today for Catalog CP

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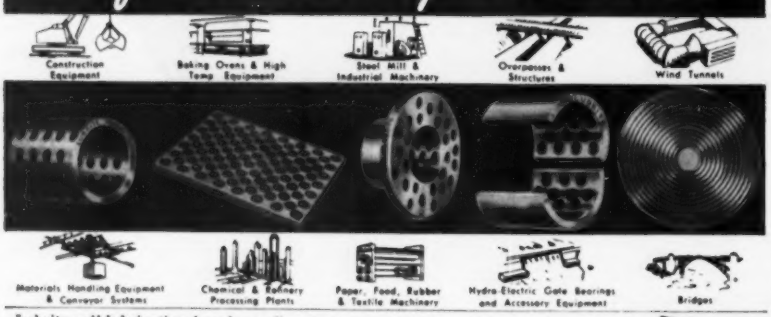
VIKING PUMP COMPANY

Cedar Falls, Iowa, U.S.A. In Canada, It's "Roto-King" Pumps
See Our Catalog In Sweet's Industrial Construction and Plant Engineer's File

***ASSURED* SELF-LUBRICATING SECURITY**
***WITH* LUBRITE®**
***Self-Lubricating* BEARINGS**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Bridges

Lubrite self-lubricating bearings offer great versatility in hundreds of fields where dependability and superior performance are of prime importance.

Lubrite Bearings, with clean, permanent, maintenance-free self-lubrication are designed to withstand severe loadings, temperature extremes, submersion, corrosion and other adverse conditions.

Lubrite may be just the bearing you need in your designs to obtain better results.

Consult our Engineering Department on your application. No obligation.

Send for this free 20-page Lubrite Manual No. 55— it contains complete information, technical data and specifications about Lubrite Self-Lubricating Expansion Plates and Bushings. Write today!

Also available — New Manual No. 56 with complete technical information about LUBRITE SELF-LUBRICATING BUSHINGS, BEARINGS & WASHERS.

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MERRIMAN BROS., INC.
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values are read directly, without use of correction factors or reference tables. Additional information on the chart is available from the publicity department of the Trane Company, LaCrosse, Wisconsin.

Russians Push Concrete

Addressing delegates to the American Concrete Institute's annual convention in St. Louis, Dr. A. Allen Bates, vice president for research and development of the Portland Cement Association, said that reinforced concrete is being used widely throughout Russia. Bates said that there is a tremendous surge in urban construction in the Soviet Union, due largely to the widespread development and use of concrete.

Last summer, Dr. Bates was head of an American delegation which toured Russia, studying construction operations in all parts of the country. He said that there are more than 2000 factories in Russia turning out precast concrete components for building units. Most of these plants are automated to such an extent that the high capital investment would be questioned seriously if used in this country.

Linseed Oil for Road Protection

The ravages of winter weather, magnified by the use of salt, are increasing the problems of road deterioration to a drastic level. The use of the salt is a particularly difficult problem, because, while it is effective in clearing roads of snow and ice, it adds greatly to the effects of scaling and spalling. Air entrained concrete has been found to resist this deterioration, but even with air entrained concete, some sort of protective surface coating often is required. The National Flaxseed Processors Association reports that tests show linseed oil is effective in protecting even nonair entrained concrete from climatic deterioration. Boiled linseed oil is superior to the raw product because of its more rapid drying and film-forming characteristics. ▲▲

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Today's Clay Pipe is an all-new product—longer, stronger, better jointed. Robinson research has played an important part in creating the fastest-laying, longest-lasting, most leak-resistant Pipe ever introduced. And Robinson's 15 strategic branches and yards get it to trenchside . . . on time.

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new **JOINTS.** Choose Wedge-Lock®, Wedge-Lock® Type "O", conforming to ASTM Designation C425, Type I and Type III; or Slip-Joint . . . Robinson has all three of the tested-and-proved factory joints.

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"If steel doesn't prove to be less

Steel cut construction time and costs in the new Kettle Mills Bridge over the Duck River.

expensive you don't owe me a cent."

Angus Jessup, Consulting Engineer, Nashville, Tennessee

Steel cuts cost 10%, construction time 60 days, in short span bridge

The project called for the replacement of the 50-year-old Kettle Mills Bridge over the Duck River in Maury County, Tennessee. The new bridge had to be built to take the pounding of trucks weighing 30,000 to 40,000 pounds, and to withstand the ravages of periodic floods. It called for a 24-foot roadway and four spans, each about 70-feet long. The county wasn't thinking in terms of steel, but Angus Jessup has been designing all types of bridges for 36 years and he had other ideas. "Let me prepare two sets of plans," he said. "If steel doesn't prove to be less expensive you don't owe me a cent."

The bids confirmed Jessup's opinion that steel is the most economical material for short span bridge construction. Compared to the other method of construction, the bid for steel came in at $70,000—over 10% less—and reduced construction time from 150 days to 90 days. And steel delivered the strength and safety they needed to combat the Duck River's floods.

The new bridge uses rolled steel structural sections on the approaches and 36-inch built-up girders in the middle span, a method that is usually found in much longer spans. The type of stream, span lengths, water depth and availability of steel led to Jessup's selection of steel. He says, "We've found that for ordinary spans, steel will usually be more economical, especially where there is flood danger."

You get many exclusive advantages when you design short span bridges in steel, including economy, less construction time, lower foundation costs, greater clearance, and prompt delivery. In addition to the advantages of structural carbon steel, the use of high strength steels and constructional alloy steel can also lead to remarkable savings in both construction and maintenance costs. For full information on USS Structural Shapes and Plates and on the family of USS Steels for Bridges, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. USS, MAN-TEN, TRI-TEN and "T-1" are registered trademarks.

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Angus Jessup, Consulting Engineer, has been designing bridges for 36 years. During the Thirties he designed nearly all the bridges for the Tennessee Toll Bridge program. His largest project today is the half-mile-long Interstate Highway bridge to span Kentucky Lake between Nashville and Memphis.

This mark tells you a product is made of modern, dependable Steel.

Close-up of the heavy, built-up beams used in the center spans. Lighter, rolled steel structural sections were used in the approaches. Steel was fabricated and erected by Nashville Bridge Company, Nashville, Tenn. General Contractor: Hagen Construction Company.

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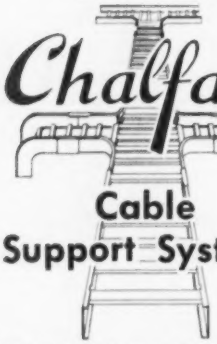

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Parallel Reading for Consulting Engineers

The Heart of London, by Monica Dickens; Coward-McCann, Inc., New York, New York; $4.95.

This is the story of what happens to the people and places in the heart of a not so highly respectable London residential district when an expressway slices it in two. It should be interesting to engineers, for it tells the story of what the new road does to people rather than what it does for them. While the lack of interest in engineering details might reveal to the reader that the author is a woman, Monica Dickens has avoided the usual feminine fault of getting too involved with her characters. She lets them tell their own story.

While her books may never become classics in the Dickens tradition, it is a sure bet that great-grandfather Charles needs to make no apology for this leaf on the family tree.

Indeed, the Cottingham Park area of London, as described by Monica Dickens, is only a 20th century stage setting for the characters which appeared in her great-grandfather's novels. Of course, they are now Teddy boys and beatniks, and things are a little bit more complicated because of the racial problem – which seems to be no different in London than in any large American city. But essentially, *The Heart of London* is in the Dickens tradition.

Monica Dickens' book has no conventional chapter headings, and in retrospect, the rapid scene changes which the author uses to tell her tale make the reader think that he should have been confused. That he was not is a very real tribute to the author's talent. She manages to weave her people and places together in a series of events that never lets the reader forget that an expressway soon will be coming through the heart of Cottingham Park – and the heart of many of its people.

•

How to Make a Habit of Success, by Bernard Haldane; Prentice-Hall, Inc., Englewood Cliffs, New Jersey; $4.95.

Only in an extremely sophisticated society – or, perhaps, an incredibly naive society – could we expect to find a veritable library of books devoted solely to the achievement of personal enrichment on a grand scale. Not so long ago, a best seller was telling us how to make one million dollars, in our spare time, by dabbling in real estate. More recently, another best seller explained how to make two million dollars in the stock market – also in our spare time. Before, during, and after these, of course, there is the ubiquitous Dale Carnegie with his spate of imitators. The time was ripe for a combination of the two: how to get rich while winning public acclaim and still being a good guy. In a word, success.

All the foregoing is not necessarily by way of detracting from the value of this book. The author is

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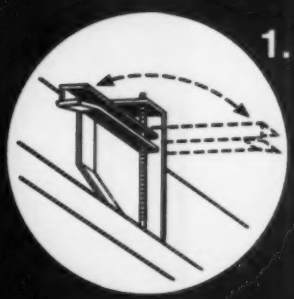

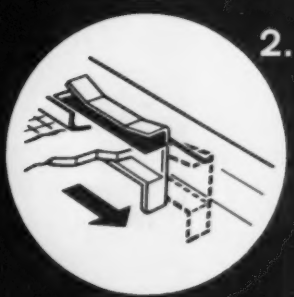

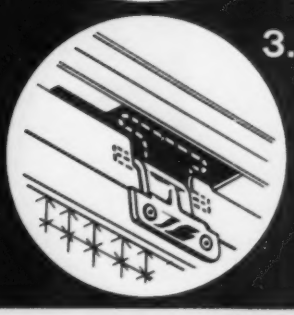

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a recognized (and successful) authority on helping others to success. His outline for advancement is reasonable. His explanations are clear. His writing is lucid. Withal, quite a presentable book. There is, however, a flaw. The people who read this book are not the ones who will benefit from what it tells them; and the people who benefit from the author's plans are, generally, the ones smart enough to figure it out for themselves.

Reading a book will not tell you how to be successful, any more than it will tell you how to fight a bull, make love, or carve headstones. The vast majority of bullfighters, lovers, and headstone cutters, if asked, would certainly admit they had not acquired their proficiency merely by reading a book on the subject.

Admittedly, some guidance, suggestion, and inspiration may come from others, but the final determination of success is within the individual. There are some who achieve an ephemeral sort of success under the direct instruction of other persons, but they are not remembered. The names we remember are Svengali and Pygmalion, not Trilby and Galatea.

•

The S-Man, by Mark Caine; Houghton Mifflin Company, Boston, Mass.; $3.00.

If you are not a success, you will want to read this book, for it will tell you how to become one. It also will give you a few chuckles, a few cold chills, and the calmly calculated courage to continue in your failing ways. For it is a fact that Mark Caine's portrait of the successful man is rather funny, but not pretty. *The S-Man* is one of those books which deadpans its way to a serious indictment of modern society. For all its cleverness, it is extremely candid. We see ourselves, and our society, not as we would like to be, but as we really are. It is a rather distressing picture.

As humor, Caine's book is a failure, for it leaves the reader with the nagging sensation that perhaps Caine is really doing what he set out to do. If he has, we must look askance at our captains of industry, our presidents, our diplomats, and our board chairmen. Most of us would rather not.

New Technical Books

PRODUCTION FORECASTING, PLANNING, AND CONTROL (3rd Edition), by E. C. MacNiece; John Wiley & Sons, New York; $9.75. MacNiece starts with the premise that the most successful companies are those in which principles of scientific management are fully understood and consistently applied. Then he goes on to an integrated discussion of the functions of management included in the title. All his material is presented from the engineering viewpoint, and may

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The same engineering know-how that goes into the manufacture of world-famous Rocker-Glo switches, makes Turnlok wiring devices supreme in their field, too. On heavy duty devices or residential, the P&S mark is your guarantee of the best your money can buy.
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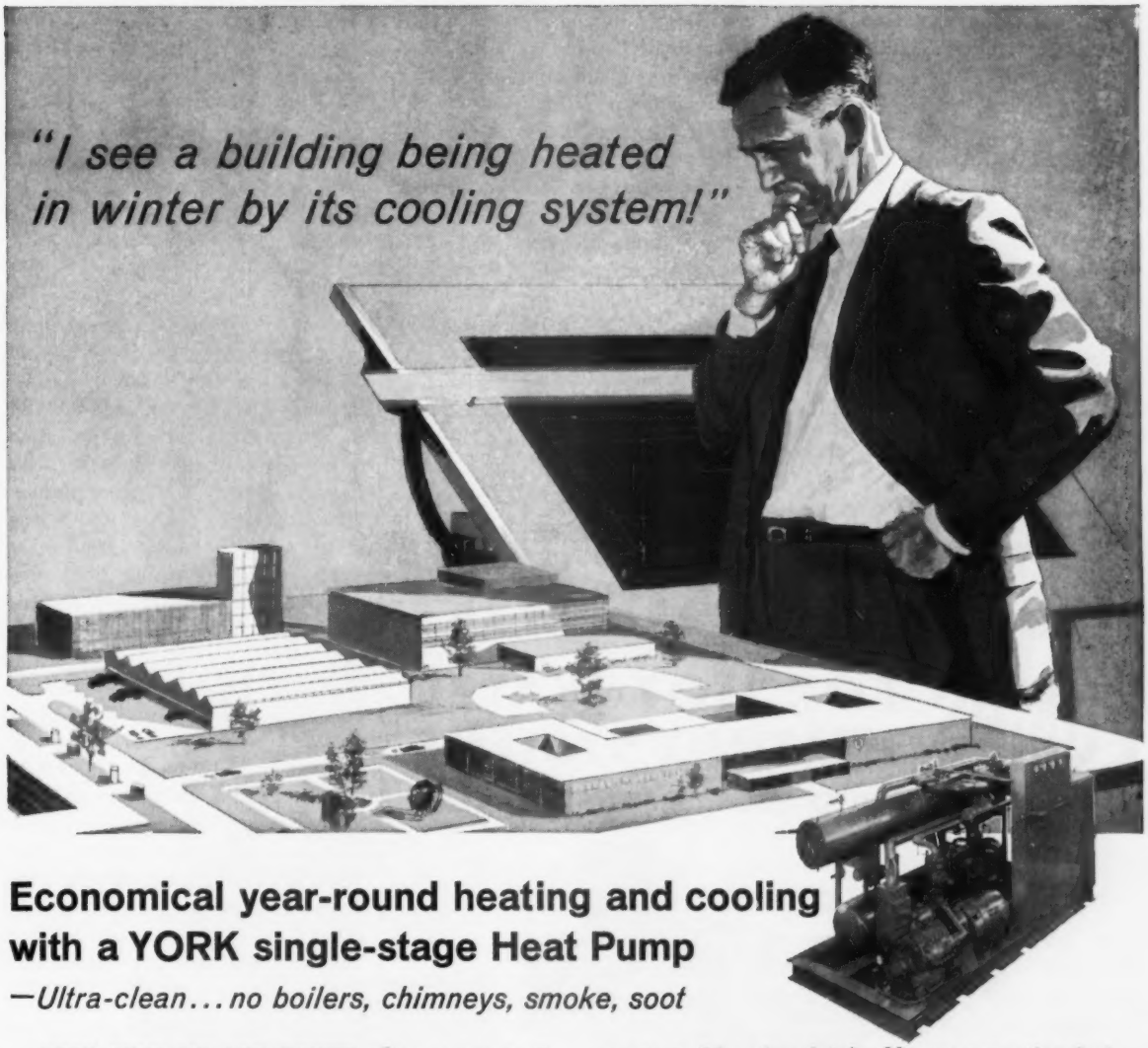


Economical year-round heating and cooling with a YORK single-stage Heat Pump

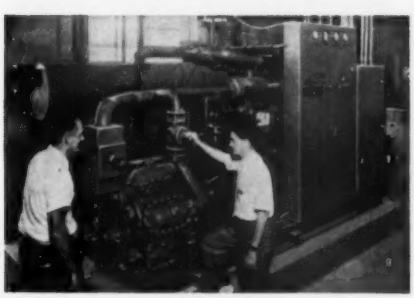
—Ultra-clean... no boilers, chimneys, smoke, soot

USES ONLY AIR AND POWER—One compact all-electric air source unit provides continuous control of temperature-humidity, plus extra cleanliness and safety. Single-stage design keeps initial and operating costs competitive.

CAN HEAT AND COOL SIMULTANEOUSLY—Versatile York Heat Pump can take heat from one area of a building needing cooling, and move it to another area needing heat. Can also utilize waste heat from exhaust air, processing, etc.

SAVES MONEY AND SPACE—No unsightly chimney to build and maintain. No space-wasting fuel storage. No boilers to tend or furnaces to feed. No boiler insurance to buy or boiler water to treat. No flames, fumes or odors.

COMPLETELY FACTORY ASSEMBLED—Saves design time and installation costs. Units are clean, tight and factory pre-tested for reliability. Packaged single stage systems are available up to 150 tons cooling and up to 750 MBH heating at 20°F. Compound compression systems also available up to *150* tons and *1200* MBH heating at 0°F.



Another YORK Trail Blazer Concept Proved In Action At *Morgan County Hospital, Madison, Ga.* —York single-stage Heat Pump provides healthful coolness in summer and clean, odorless heat in winter for year-round comfort of patients and medical staff. Factory assembled unit delivers 50 tons of cooling and 230 MBH heating at 10°F.

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help the consultant better to understand the problems and needs of his industrial clients.

AIR POLLUTION, by World Health Organization; Columbia University Press, New York; $10.00. Ten years ago, total losses in the United States as a result of air pollution were estimated at $1.5 billion — and the picture has grown steadily worse for the past 10 years. In addition to the property loss, smog and various industrial fallout products cause untold sickness and death throughout the world. This study of the problem by the World Health Organization considers the medical, physical, chemical, and legislative aspects of air pollution. Recent developments in combatting pollution are covered, with a discussion of specific problems.

DICTIONARY OF MECHANICAL ENGINEERING, by Alfred Del Vecchio; Philosophical Library, New York; $6.00. This illustrated text deals primarily with terms in the fields of engineering mechanics, architecture, automatic controls, fuels and combustion, and power plants. It also contains related material on basic electricity, metallurgy, and mathematics.

SEPARATION PROCESSES IN PRACTICE, edited by Robert Chapman; Reinhold, New York; $4.95. A recent "Experience In Industry" symposium held by the Philadelphia section of AIChE covered separation processes in great detail, and this book is a result of that symposium. The first two chapters review the past and future of separation processes; the rest of the book discusses individual processes such as ion exchange and crystallization.

The Concrete Industry Board, Inc., has published a *Manual of Recommended Practice for Concrete Floor Finishes.* The 16-page booklet lists the board's recommendations for the commonly used finish surfaces, including monolithic finish, bonded topping, nonslip surfaces, and exposed aggregate finishes. Publication is available from the Concrete Industry Board, 220 East 42nd Street, N. Y., N.Y.; $1.00.

The American Iron and Steel Institute has published a booklet of information on the development and production of corrugated steel sheets and their use in building construction. Copies of the booklet, *Sectional Properties of Corrugated Steel Sheets,* are available without charge from the Institute, at 150 East 42nd Street, N. Y., N. Y.

The Atomic Energy Commission is issuing, without charge, copies of a brochure listing nuclear reactors built, being built, or planned in the United States as of December 31, 1960. The booklet, *TID-800, 3rd Revision,* is available from the AEC Office, P. O. Box 62, Oak Ridge, Tennessee. ▲▲

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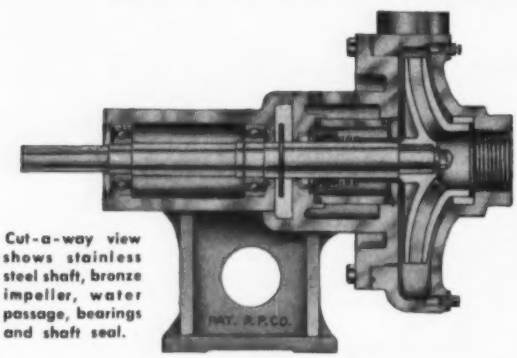

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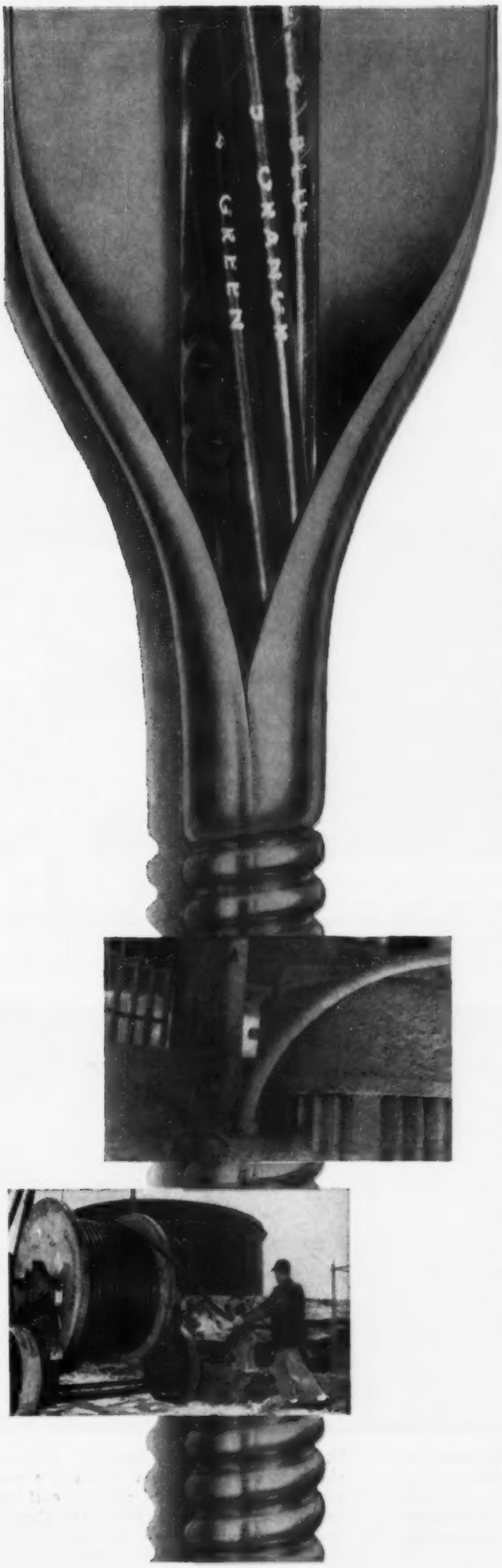

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An East Coast petroleum tank farm used a C-L-X 8-conductor cable protected with PVC for direct burial in ground that was saturated with oil, gas and water. Result: Perfect performance at a sizeable savings over conduit systems.

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Shown discussing the customer merits of a newly installed 112½ KVA Sorgel Dry-Type Transformer are Mr. Richard R. Pooley, Facilities Manager of Tektronix, Inc.; Mr. Jerry Jones, General Superintendent, W. R. Grasle Company, Electrical Contractors, Portland, Oregon; and Sorgel Sales Engineer, Mr. Henry C. Lehl. This transformer is installed in Tektronix's main facilities at Beaverton, Oregon. The Contractor commented on the fast installation of Sorgel units because of knockouts on all sides and easy accessibility to terminal connections.

1/4 KVA TO 10,000 KVA, ALL STANDARD AND INTERMEDIATE VOLTAGES UP TO 15,000 VOLTS

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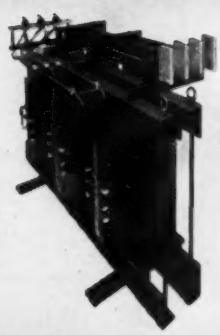

The transformer is the heart of your entire electrical system. Here is where true quality gives you dependability and low cost operation. Illustrated is a 500 KVA, 5 KV class, for a Sorgel unit substation.

If you BUY, SPECIFY or INSTALL transformers, YOU SHOULD KNOW THESE IMPORTANT FACTS

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These engineered advantages show why Sorgel dry-type transformers are considered the finest in the electrical field. These quality features, and many others, assure you of economy in installation and operation.

- All coils have end filler protection in each layer to prevent movement of conductors under heavy loads and short circuit stress conditions.
- The transformer core and coil unit is specifically designed for low sound level. In units 15 KVA and larger, the core and coils are mounted on vibration dampening pads designed to suppress transmission of vibration to adjacent areas.
- Each unit is completely assembled, wired, and tested at the factory, ready for line and load connections eliminating any job-site assembly.
- All terminations are securely anchored, and solderless connectors are furnished on all transformers with terminal boards. Vacuum impregnated windings are brazed to the terminals.
- Connection covers are cushioned and easily removed by means of two captive bolts on small sizes, and four on larger sizes.
- Ventilating openings are designed to prevent accidental access to live terminal parts. Expanded metal is not used on sides, back or front.
- In Quiet-Quality units, performance data, such as core loss, copper loss, sound level, etc., is always equal to, or lower than, the guaranteed values submitted to the customer.
- Sorgel units are individually tested in accordance with NEMA standards. Certified tests are furnished upon request, to further substantiate the guaranteed data.

Contact your nearest Sorgel Sales Engineer for additional reasons why Sorgel units are truly your most economical buy - as quality pays, it doesn't cost.

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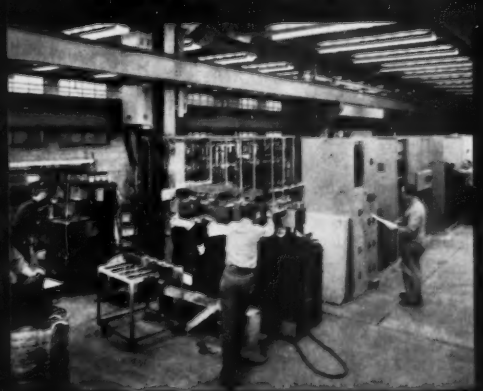

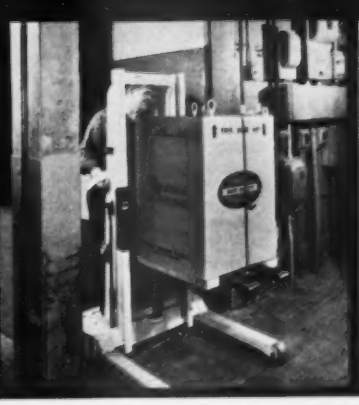

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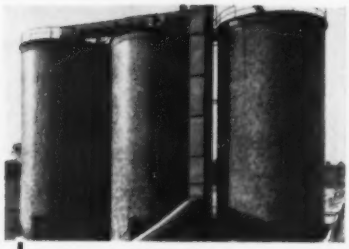

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Michel Templeton 8-6400

Consulting Engineers' Calendar

May 4-6. 1961 Annual Meeting of Consulting Engineers Council, Chicago. Business meetings will be conducted at the Executive House, on the north side of the Loop. New Council officers will be installed during the meeting, and the annual banquet will be held at the Illinois Athletic Club Friday evening, May 5.

May 5-6. New Jersey Society of Professional Engineers; Annual Convention, Ambassador Hotel, Atlantic City, New Jersey.

May 7-10. American Institute of Chemical Engineers; Meeting, Sheraton-Cleveland, Cleveland, Ohio.

May 11-13. Acoustical Society of America; Spring Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa.

May 16-18. Building Research Institute; Spring Conferences, Shoreham Hotel, Washington, D. C.

May 19-20. New York State Association of Consulting Engineers, Inc., 4th Annual Convention, Treadway Inn, Niagara Falls, New York.

May 22-26. Society of Photographic Scientists & Engineers; National Conference, Hotel Commodore, New York, New York.

May 27. New Jersey Association of Consulting Engineers; Annual Meeting, Hotel Berkeley-Carteret, Asbury Park, New Jersey.

June 4-9. American Water Works Association; Annual Conference, Detroit, Michigan.

June 6-8. West Virginia University; Sixth Annual Appalachian Underground Corrosion Short Course, Campus, Morgantown, West Virginia.

June 7. American Institute of Consulting Engineers; Luncheon Meeting, Engineers' Club, New York, N.Y.

June 11-15. American Society of Mechanical Engineers; Semiannual Meeting, Statler-Hilton, Los Angeles, Calif.

June 12. Instrument Society of America and Air Pollution Control Association; Air Pollution Instrumentation Symposium, Hotel Commodore, New York, New York.

June 18-23. American Institute of Electrical Engineers; Summer General Meeting, Ithaca, New York.

June 21-July 1. International Commission on Large Dams; 1961 Congress, Rome, Italy.

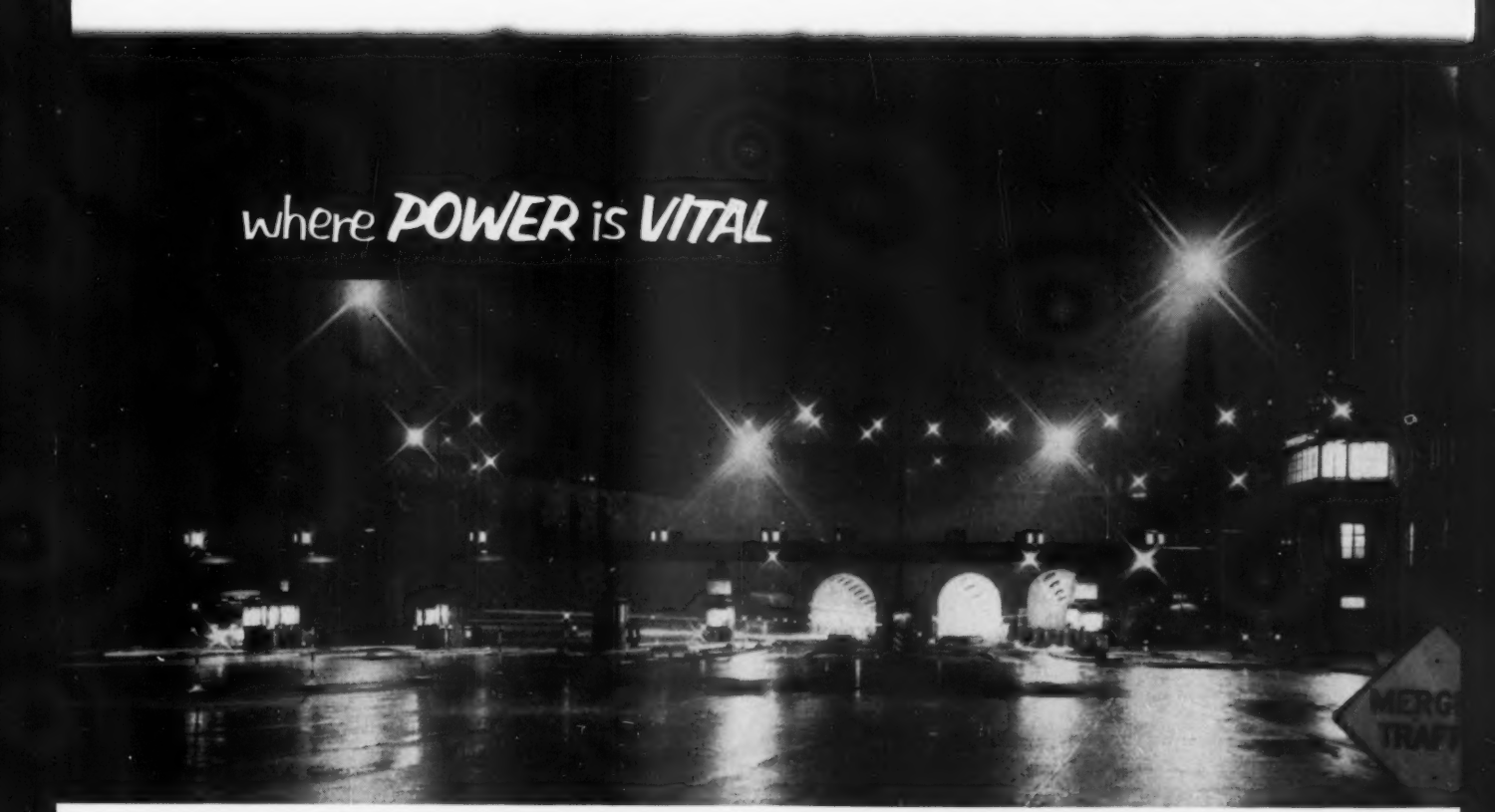
June 23-24. Missouri Society of Professional Engineers; Annual Convention, Governor House, Jefferson City, Missouri.

June 25-30. American Society for Testing Materials; Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, New Jersey.

June 25-30. Pennsylvania State University; Engineering Seminar — "R and D Management Development," University Park, Pennsylvania.

June 26-28. American Society of Heating, Refrigerating and Air-Conditioning Engineers; Annual Meeting, Denver Hilton Hotel, Denver, Colorado.

June 26-30. Amercian Society for Engineering Education; Annual Meeting, Univ. of Kentucky, Lexington, Ky.



ASCO Remote Control Switches and Transfer Switches assure dual protection for Lincoln Tunnel.

Light or power failure in the Lincoln Tunnel or on its highway approaches could have disastrous consequences – for thousands of cars and trucks pour through the underwater throughway every day. This is why engineers selected ASCO Remote Control Switches and Automatic Transfer Switches in several strategic locations.

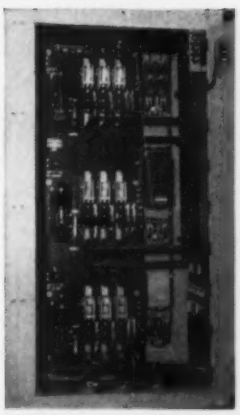
ASCO REMOTE CONTROL SWITCHES help provide the proper voltages to tunnel lighting and adjacent highway lighting. Triple interlocked ASCO Remotes are used for switching the primaries of transformers feeding 800, 1000, 1200 volt fluorescent lighting circuits. Three lighting circuits are required because of the starting characteristics of two fluorescent tubes in series. On cold days, 1200 volts are required to "strike the arc" across a pair of fluorescents. On warm days, only 800 volts are needed. An additional benefit – higher voltages can compensate for lamp aging. Check these advantages of ASCO Remote Control Switches:

• Standard listings in capacities from 30 to 1000 amperes; available to 750 volts AC or DC • Available to 24 poles, single or double throw • Mechanically Held, Electrically Operated . . . unaffected by line voltage conditions; respond only to push buttons. Insure against outages on vital circuits caused by momentary line voltage drops.

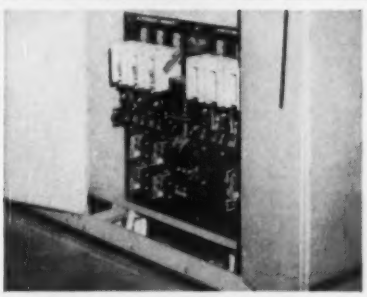
ASCO TRANSFER SWITCHES, specified in many other applications where power is vital, guarantee continuous power to such vital services as tunnel pumps, control rooms, and fire alarm systems. They feature these basic advantages of ASCO Transfer Switches:

• continuous duty rating in either normal or emergency position • capacity to withstand inrush currents 20 times full load rating • mechanical locking, providing sure contact pressure • single coil design • built-in time delay, so that equipment ignores harmless momentary outages • accessories to meet your specific requirements • full phase protection and other design features.

Write for Catalog 57-S2 on ASCO Remote Control Switches – for Booklet 596 describing how to select an adequate automatic transfer switch – or for Catalog 57-S1 on ASCO Automatic Transfer Switches.



Triple interlocked Bulletin 911-163S Remote Control Switches are used for switching the primaries of transformers feeding 800, 1000 and 1200 volt fluorescent lighting circuits.



Typical ASCO Bulletin 906-166 Automatic Transfer Switch provides auxiliary power for the circulating pump, the sewage ejector, the sump pump, the essential service bus and the control room.

ASCO Electromagnetic Control

Automatic Switch Co. 50-CC HANOVER RD., FLORHAM PARK, N. J., FRONTIER 7-4600

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Nothing equals the versatility, quality and economy of Mineral Insulated Cable for jobs up to 600 volts! ☐ It's fast—MI Cable is rigid, yet so flexible electricians make even complex bends by hand, right on the job. ☐ It saves money: since MI Cable takes fewer man-hours to run—you get a better job quicker, at lower cost. ☐ It's safe—MI Cable is solid, ending problem of moisture, heat and

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explosion. ☐ Get the full details on MI Cable. Write for Catalog S-2. General Cable Corporation, 730 Third Avenue, New York 17, N.Y.

1 Your truck is a complete convenient shop for wiring any job with MI. 2 Only MI Cable could still be in perfect shape—without special protection—after weeks of rain that stopped all other work. 3 Compact—that's MI Cable. Here, 36 separate lines leave a motor control center in rewiring a paperboard plant.

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SILICONE NEWS from Dow Corning

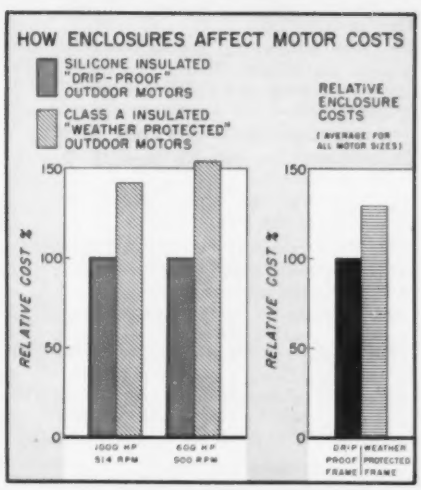
What Price Difference?

There's No Price Premium . . . Just Savings . . .When You Specify Silicone Insulation

For Outdoor Locations: You can save 30% and more on initial cost of form-wound motors by specifying silicone insulation systems made with Silastic, the Dow Corning silicone rubber. Here's why: 1) Silicone insulated motors are now available at no price premium; 2) The insulation system itself is self-protecting, shrugs off weather, humidity, corrosion, dust, even flooding. There's no need for elaborate enclosures that push motor prices up and up. The chart (right) shows how much you save by specifying silicone insulated open motors.

For Indoor Locations: Where ambient temperatures are high, where corrosive fumes or industrial contaminants are present; where relative humidity is pushing 100%; where motors are hosed down — in all these applications and others, too, expensive motor enclosures, and often expensive ducting as well, can be eliminated by specifying silicone insulation.

For Any Location: Silicone insulation systems increase motor service factor by as much as 15 to 30% because of their greater thermal stability. This increased service factor means there's no need to overmotor for occasional overloads . . . and suffer the power factor penalty of part loaded induction motors.



This chart shows one of the ways you save by specifying motors insulated with Silastic.

New brochure on Silicone Insulation. Write for your free copy. Address Dept. 2317.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

Some Straight Talk On Steam Trap Capacity

...or pulling away the curtain of confusion that surrounds steam trap capacity ratings.

Unfortunately, for the steam trap buyer, the subject of steam trap capacity has become cloudy and confused by a landslide of claims, counterclaims and inconsistent "standards" for measurement. So let's take a cold hard look at this subject so vital to the efficient operation of your plant.

What Determines Steam Trap Capacity?

There are three factors that determine the capacity of a steam trap:

1. The area of the orifice.
2. The density of the condensate.
3. The pressure differential across the trap.

Let's take a closer look at each of these:

Area of orifice is usually specified by the trap manufacturer or can be calculated from the diameter. Nothing complicated here.

Density of condensate depends on temperature. A cubic foot of cold water weighs 62.4 lbs. At 250° F. or 15 psi, it weighs less than 59 lbs. This is important. Don't overlook it.

Pressure differential across the trap is most significant. And it is complicated by the many factors that affect it, such as:

1. Pressure drop between unit drained and the trap when the trap valve is open.

2. Distance the trap valve is moved from the valve seat.

3. Back pressure on the trap with orifice closed; i.e., return header pressure.

4. Increase in back pressure produced by condensate and flash steam flowing in the discharge line. This in turn is affected by the diameter and length of the discharge line, plus friction caused by valves and fittings.

Orifice Capacity Vs. Steam Trap Capacity

Figure 1 shows a ½" diameter sharp-edged orifice at the end of a pipe filled with cold water at 15 lbs. pressure. The capacity of this orifice, using a .61 coefficient of flow would be 8,800 lbs. per hr. Now, would this ½" orifice if used in a ¾" steam trap installed as shown in Figure 2 provide the trap with a continuous discharge capacity of 8,800 lbs. of hot condensate per hour? The answer is "no". And here are some of the reasons why:

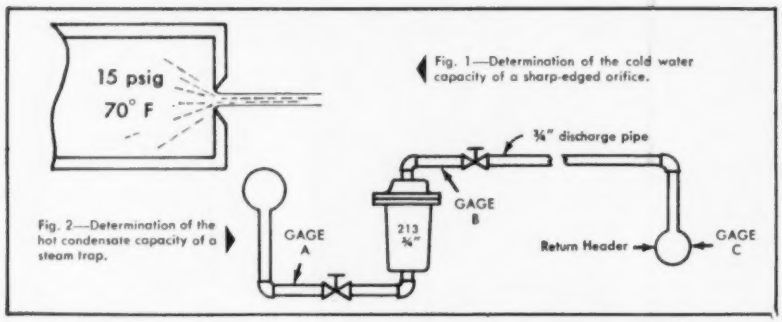


Fig. 1—Determination of the cold water capacity of a sharp-edged orifice.

Fig. 2—Determination of the hot condensate capacity of a steam trap.

Density of condensate. As pointed out above, cold water weighs 62.4 lbs. per cu. ft. At 15 lbs. pressure and 250° F. water weighs less than 59 lbs. per cu. ft. This difference in density alone reduces the lbs. per hour capacity of the orifice by over 5%.

Pressure differential across the trap. With the trap valve closed we have a static pressure differential of 15 psi. The trap valve must be able to open against this pressure. However, this is not the pressure differential that will determine the capacity of the trap valve.

The ¾" discharge line will be full of a mixture of flash steam and condensate. To keep this mixture flowing from the trap outlet to the return line requires a pressure differential. In actual capacity tests run as shown in Figure 2 Gage B at the trap outlet registered 11 lbs. back pressure. Thus the true pressure differential across the trap was about 4 lbs. Under these conditions the measured capacity of the trap was 4,340 lbs/hr. or just about half of the capacity of the ½" orifice for cold water.

How Armstrong Determines Capacity Ratings

Armstrong trap capacity ratings are based on hundreds of tests under actual operating conditions. In these tests, the condensate used was at the steam temperature corresponding to the test pressure. Thus, the capacities determined take into account the pressure drop that occurs when the trap orifice opens and the choking effect and back pressure of the flash steam. Actual installation hookups were used so that pipe friction in both inlet and discharge lines as well was reflected in the results.

Let's go back to the example cited above and in Figure 2. The trap referred to is an Armstrong No. 213. While it did test out at 4,340 lbs. per hour for a static pressure differential of 15 psi, it is rated in the catalog at only 3900 lbs. per hour for this pressure—just to be on the safe side.

For the trap buyer, this means that Armstrong Steam Trap capacities are based on handling condensate at steam temperature for the stated static steam pressure differential under actual working conditions.

Capacity ratings which don't take into account all of the variables will be misleading and may lead to the selection of undersized traps. So whenever you specify or buy traps be sure that the capacity ratings you work from are realistic. One way to be sure is to select Armstrong Traps with *guaranteed* capacity ratings.

* * *

Additional information on trap capacity ratings, plus data on how to correctly size, install and maintain steam traps for any pressure, any temperature and any load, are presented in the 48-page Armstrong Steam Trap Book. Ask your local Armstrong Representative for a copy or write:

Armstrong Machine Works
9658 Maple Street
Three Rivers, Michigan

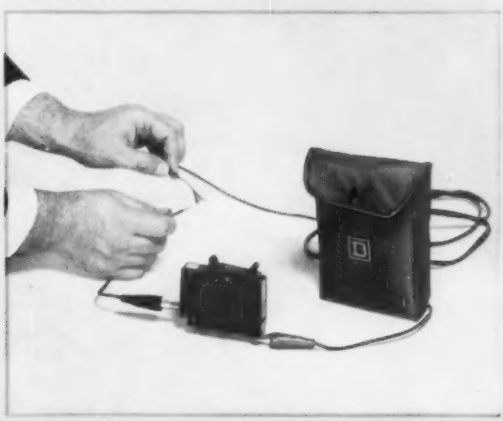
ARMSTRONG STEAM TRAPS

Want proof that the QO circuit breaker is THE FINEST BREAKER EVER BUILT?

—It's in the Bag...

ABOVE • **No bag of tricks—a QO breaker, a lamp cord, a receptacle, a few spring clips and a paper clip are all it takes to prove QO's case by actual performance.**

ABOVE • **Push-in terminals, a Square D exclusive, provide fast, positive connections. A standard time-saving feature on all QO TANDEM breakers. Notice how the QO TANDEM breaker shown above combines 2 full-size breakers in 1 space-saving unit.**



AT LEFT • **The frayed cord test shows how QO breakers give positive protection against "*flash*" shorts. Conventional overcurrent protectors provide overload and short circuit protection for branch wiring, but don't open fast enough to protect smaller extensions from such shorts.**

●

Make a demonstration date with your Square D Field Engineer...or let us send you the complete story. Address Square D Company, Mercer Road, Lexington, Kentucky.

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Where perimeter heat is indicated, *Nesbitt Sill-line Radiation* is your prescription. The five Sill-line accessories shown here illustrate but one way this product has been designed to provide a better solution to most installation conditions. There are many others: the five enclosure styles; the six decorator colors; the one-piece back panel that permits mullion-to-mullion application on panel walls. All point up the versatility of *Nesbitt Sill-line Radiation*. For the full story, send for publication 30.

MEMBER

Sill-line Radiation is made and sold by
John J. Nesbitt, Inc., Philadelphia 36, Pa.

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The world's most beautiful perimeter radiation

PART 2

5

Consulting Engineer

DIRECTORY OF ADVERTISERS' LITERATURE

Keep This Directory

in Your

Technical Reference File

ST. JOSEPH, MICHIGAN

Part 2

May 1961

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AIR CLEANERS & DUST COLLECTORS

1—Oil Bath Air Cleaner

Bulletin 160-C describes new *Cycoil*, Type P, low resistance oil bath air cleaner for smooth flow applications. Provides complete operation information, detailed parts drawings, construction features, dimension drawings, oil recommendations, maintenance procedures, filter cell service, size selections.

American Air Filter Co., Inc.

2—Fume and Mist Precipitator

Bulletin 251C describes Model B *Electro-Mist*, electronic precipitator for oil mist, fume collection. Self-contained unit abates fire hazards created by condensed oil mist, reduces need for frequent cleaning of adjacent areas, collects up to 10 gallons of oil per day for re-use, returns cleaned air to work room.

American Air Filter Co., Inc.

3—Dry-Type Unit Filter

Bulletin 228 describes new *DRI-Pak* dry-type unit filter. Light-weight unit answers need for high efficiency, low resistance, compactness and unusual dust holding capacity. Filter inflates when system is in operation, deflates when shut down, contains disposable cartridge, requires less storage space.

American Air Filter Co., Inc.

4—Renewable Media Air Filters

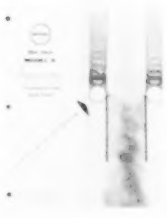
Bulletin 248-E combines technical information for both the vertical and horizontal models of the *Roll-O-Matic* automatic renewable media air filter. Explains the modular design which permits easy, on-the-job assembly. Includes dimension drawings, capacity tables, shipping weights and discussion of media.

American Air Filter Co., Inc.

5—Dust Collectors

Bulletin 727 describes Dustkop Dust Collector Series No. 5000, which is suitable for grinding, buffing, polishing, woodworking, machining and other applications where large volumes of air are required. Will service up to eleven combinations of machines. Air volume 5000 cfm, capacity to 38 cu ft.

Aget Manufacturing Co.



6—Reverse-Air Jet Dust Filters

Bulletin 2131 describes Koppers' new *Aeroturn* reverse-air jet dust filter. Diagrams and photographs combined with descriptive data show operation and construction details resulting in virtually 100% filtering efficiency, long life, and economical operation. Complete specifications and accessories included.

Koppers Co., Inc., Metal Products Div.

7—Cube Replacement Air Filters

Bulletin B, 4 pages, illustrated, describes cube air filters. Physical process of reverse loading, primarily responsible for high efficiency and long life of unit, is described in detail. Diagram illustrates typical arrangements, and data table lists capacity and resistance of dozen sizes. Assembly procedures pictured.

Union Carbide Development Co.

8—Air Distibution, Purification

Bulletin 31F describes representative models in the Kno Draft lines of air diffusers, grilles and registers, and high velocity equipment, and the Dorex line of air recovery and purification cells and canisters. Recent additions to the "Architects' Group" of rectilinear diffusers, type KO perforated, type KSS vari-pattern.

Connor Engineering Corp.

9—Dust Collection Systems

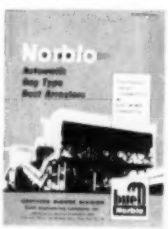
Bulletin 61 describes the complete line of Buell-Norblo dust collection and recovery systems. Included are electric precipitators, mechanical collectors, bag collectors, systems. Photographs show installations of equipment. Cutaways show construction. Comprehensive bulletin on each type of equipment.

Buell Engineering Co., Inc.

10—Industrial Dust Collectors

Catalog 359 describes briefly complete line of Torit dust collectors for industry. Current models of both self-contained cabinet cloth filter type and cyclone separators are illustrated with dimensions and specifications for each. Installation photographs illustrate all models in use. Accessories are listed.

Torit Manufacturing Co.



11—Automatic Dust Arresters

An entirely new, more complete brochure describing Norblo automatic bag type dust arresters. Identified as Bulletin 164-6 the eight pages are fully illustrated. Continuous operation at full capacity is explained as it applies to both pneumatic and mechanically operated cleaning systems. Dimensions, capacities.

Northern Blower Div., Buell Engrg. Co.

12—Roll-Kleen Air Filter

Bulletin B-1400-8 describes the new V-7 *Roll-Kleen* air filter for large volume service. Disposable filtering media unwinds from a new media supply roll at the top and winds the used media on a roll at the bottom. Information includes advantages, installation, maintenance, dimensional drawings, capacity tables.

Farr Co.

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AIR CLEANERS & DUST COLLECTORS *continued*

13—Glass Bag Filters

"Freedom from Hot, Corrosive Dust with Glass-Bag Filters" describes ways to lick tough air pollution problems. Bulletin 806 shows how the glass-bag filters in cement and metallurgical plants clean gases at temperatures up to 600°F. Two patented bag cleaning techniques also are discussed.

Dracco Div. of Fuller Co.

17—Cyclone Dust Collectors

Bulletin C-103 describes design and construction of Buell high-efficiency cyclones. Features include exclusive "Shave-off" port which traps extra percentage of dust, particularly smaller fines. Fully illustrated. Lists all information necessary for specifying. Covers importance of manifolding.

Buell Engineering Co., Inc.

14—Dust Collection Equipment

Bulletin 721 describes the Dustkop Series 300 Dust Collector designed for laboratory type grinding and polishing. It is an air recirculating type collector, with an air volume of 260 cfm to 314 cfm and a dust storage capacity of 1/10 cubic foot. Complete dimensional data is clearly shown on line drawings.

Aget Manufacturing Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

15—Air Purification Equipment

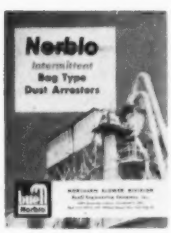
Bulletin 108A describes and illustrates *Dorex* activated carbon air purification equipment, C cells and H canisters. Data on equipment selection, installation, application is provided. Also given is information on unique *Dorex* replacement service. Discussions of activated carbon and conditions for proper purification.

Connor Engineering Corp.

18—Panel-Type Air Filters

Bulletin A1, 4 pages, illustrated, describes advantages of new filter which provides up to 100 per cent longer life than other throw-away types. Describes how three-dimensional batt permits elimination of face supports and facilitates depth loading. Installation data, filter sizes, and arrangement.

Union Carbide Development Co.



16—Intermittent Dust Arresters

Completely revised and augmented catalog of Norblo intermittent bag type dust arresters is issued as Bulletin 163-6. Wide range of capacities covered in permanent and semi-portable sizes. Drawings and accessories descriptions provide more complete reference data. Complete dimensions included.

Northern Blower Div., Buell Engrg. Co.

19—Automatic Dust Collector

Bulletin FM60 describes new line of Torit fully automatic continuous operating dust collectors. Available in ranges up to 60,000 cfm and higher, these collectors are of extremely high efficiency, yet weigh less than one-half of standard equipment due to their aluminum construction. Illustrations show application.

Torit Mfg. Co., Automatic Division.

AIR CONDITIONING & REFRIGERATION

20—Packaged Hermetic Chillers

Bulletin 3926 includes selection data, specifications and unit description of this new hermetic chiller. *Versare* offers many features not standard with competitive units. A special indicator system of 8 pilot lights, accessibility, rugged protective base, compact design, and pressure gages are bonus features.

American-Standard Industrial Division.

21—Packaged Liquid Chillers

Bulletin L150.18-S describes the New York direct expansion type packaged liquid chillers. Capacities from 50 to 125 tons. Complete specifications on compressor, motor, liquid chiller, condenser, and controls. Complete physical data also included. Photographs show this factory performance-tested chiller.

York Corp.

AIR CONDITIONING & REFRIGERATION *continued*

22—Packaged Chillers

Construction details, specifications, capacity and dimensional data on Acme Model RG *Flow Cold* packaged water chillers are contained in Catalog 91-515. This lightweight, compact chiller line offers 9 models, 3 to 30 tons, all performance certified and completely packaged ready to install.

Acme Industries, Inc.

23—Dual Duct Air Mixing Units

Bulletin DD-6 describes dual duct air mixing units for high and low velocity systems. Detailed information includes blue prints showing different arrangements for same space, cross-section diagrams, dimensions, performance data, and complete specifications. Installation and product photographs are shown.

Buensod-Stacey, Inc.

24—Air Conditioner, Humidifier

Bulletin 140 describes means of precise manipulation of humidity and temperature, air-conditioning critical processes of drying, and holding heat-sensitive materials, using absorbent liquid to dry air at moderate temperature without refrigeration. Diagrams, photos, chart of dehumidification, units up to 20,500 cfm.

Niagara Blower Co.

25—Packaged Liquid Chillers

Catalog 30H27 gives all necessary information about Carrier hermetic reciprocating liquid chilling packages. Offered in capacities of 15, 20, 25, 30, and 45 tons, they represent the most compactly designed chillers we have ever offered. Furnishes you with ratings, descriptions, dimensions, and pertinent data.

Carrier Air Conditioning Co.

26—Ceiling Diffusers

Catalog F-4085-6 includes descriptions of *Venturi-Flo* ceiling diffusers, application and selection data, and ordering information. Revised performance tables make selection easier and faster. *Deflectrols*, volume controls, and other accessories are also included. Installation instructions.

Barber-Colman Co.

27—Rotary Evaporative Coolers

Illustrated bulletin B-1100-IF describes a rotary evaporative cooler with bronze screen rotor that rotates continuously through a water tank. Automatic operation. With addition of blower, motor and air filters, a complete, self-contained "Package Cooler" can be supplied. Eight sizes from 2,500 cfm to 16,000 cfm.

Farr Co.

28—Air Cooled Condensers

Bulletin 300 presents Bohn's new line of air cooled condensers in capacities from 2 to 120 tons. Engineering data is presented for selection of units by evaporator capacity or heat of rejection method. Limitizer head pressure control system and multi-circuiting fully described. Completely illustrated.

Bohn Alum. & Brass Corp., Danville Div.

29—Air Handling Units

Bulletin 6011C describes compact line of air handling units. Contains valuable engineering section including methods of coil selection, typical design problems and example, as well as basic engineering information on air conditioning and heating fan capacities. Coil ratings and complete dimensional data are included.

Dunham-Bush, Inc.

30—Air Cooled Packaged Units

Catalog LL-484 describes Chrysler *Airtemp* all-in-one air cooled packaged units. Units' versatility for business and home are described, specifications listed, and ease of installation discussed. Units leave factory fully assembled, pre-wired and ready for installation. Capacity range is 25,000-35,000 Btuh.

Chrysler Corporation, Airtemp Division.

31—Air Conditioned Unit Ventilators

Bulletin 635-EIA contains complete data for application of *Hernel-Cool* III air conditioning unit ventilators for school classrooms. Construction features, system design, operation and controls, selection procedures, capacity tables and charts, dimension and application drawings and suggested specifications.

American Air Filter Co., Inc.

32—Curtain Wall Air Conditioners

Bulletin PW-319 describes a new concept of curtain wall function, room-by-room air conditioning, an integral part of the Lupton curtain wall system. This is a true perimeter type system affording individual room control. It is a space saver and is easily installed. Includes capacities, dimensions, and specifications.

Michael Flynn Manufacturing Co.

33—Air Conditioning Water Chiller

Bulletin 1840 described Waukesha Motor Company's new 100 ton air conditioning water chiller unit. Power supplied by a model 140-GZ, 6-cylinder gas engine. A complete package unit including control panel for automatic operation. Schematic installation diagram with dimensions. Components, accessories.

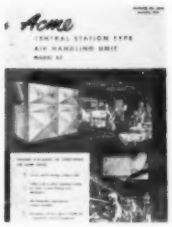
Waukesha Motor Co.

AIR CONDITIONING & REFRIGERATION *continued*

34—Cooling Coils

Described in bulletin B-1818 is a new complete line of cooling coils now available from American-Standard Industrial Division. Coils included are standard water, drainable water, cleanable water and direct expansion. The coils feature low air friction with maximum heat transfer, and rust resistant casings.

American-Standard Industrial Division.



35—Air Handlers

Catalog 382A describes and illustrates Acme Model AC central station air handling units. 15 compact sizes, 30 models, horizontal or vertical styles, interchangeable components for complete flexibility. Provides year around air conditioning for large areas. Dimensions, capacity data, and optional accessories.

Acme Industries, Inc.

36—Water Chilling System

Catalog EM 60-2235 describes the compact hermetic *Turbopak* used for various water chilling applications. Capacity 65 to 600 tons. Most compact hermetic centrifugal water chilling system. Cutaway shows operation and component parts. Operation is carefully explained. Diagram shows dimensions. Specifications.

York Corp.

37—Dual Duct Air Conditioning

Bulletin DD-7 discusses space requirements for risers, apparatus rooms and ceiling arrangements for Dual Duct Air Conditioning Systems. Includes basic apparatus arrangements, methods of design, and a discussion of the results to be obtained. Isometric examples of air distribution methods and other information.

Buensod-Stacey, Inc.

38—No-Frost Freezing and Storage

Bulletin 105 shows improved apparatus to prevent frost accumulation on refrigerated coils of large scale freezing or cold room installations. Convenient disposal of condensed moisture and completely automatic, trustworthy refrigeration with rapid chilling of products and assured holding of low temperatures.

Niagara Blower Co.

39—Engineered Air Distribution

Condensed catalog F-4471-8 allows designers of air distribution systems to quickly survey the wide range of equipment designs, sizes, finishes, and applications available from Barber-Colman. Included in this 1961 catalog is information on new continuous-line diffusers in several basic styles.

Barber-Colman Co.

40—Packaged Chillers

Technical data in catalog 8023A is pertinent to Heat-X 20 through 100 ton, package chillers, semi-hermetic and direct drive. Describes *Inner-Fin* construction of chiller and heat exchanger passages (patented feature exclusive with Heat-X) for greater cooling capacity with less bulk. Specification chart.

Dunham-Bush, Inc.

41—Lo-Aire Unit Cooler

Bulletin 260 describes the Bohn *Lo-Aire* and a new concept in unit cooler design for commercial refrigeration. These units provide positive low air movement for employee comfort and maintain high relative humidity to reduce product shrinkage. Available with *Bohn-El* defrost system for 28° storage temperature.

Bohn Alum. & Brass Corp., Danville Div.

42—Roof Mounted Conditioners

"RMC" Roof Mounted Conditioners for heating and cooling are described in bulletin 6023A. Compactly designed for rooftop installation on single story office buildings, factories, supermarkets, arenas, and theaters. Factory wiring, interior plumbing assembled, air cooled, no plumbing or piping connections.

Dunham-Bush, Inc.

43—Split System Units

Catalog 487 describes Chrysler *Airtemp's* complete line of air cooled and water cooled split system equipment. Specifications and dimensions are listed for all condensing units and rated capacity for matching evaporator units indicate the pairings required for air conditioning. From 22,000 to 420,000 Btuh.

Chrysler Corporation, Airtemp Division.

44—Compressors and Condensers

The comprehensive catalog 6 GL-26 describes the Carrier lines of hermetic compressors and condensing units. Ideal for most applications requiring air conditioning or refrigeration systems, they feature capacities from 5 to 150 tons. Includes schematics and photographs. Furnishes complete ratings and data.

Carrier Air Conditioning Co.

45—Engines for Air Conditioning

Bulletin 1754 describes Waukesha gas engines designed for air conditioning units. A complete range of sizes from 10 to 800 ton capacities are available. Specifications, including horsepower ratings, are given in tabular form. Engines components and accessories are listed and described. Installations shown.

Waukesha Motor Co.

AIR CONDITIONING & REFRIGERATION *continued*

46—Standard Air Conditioning Unit

Bulletin D-100 describes Standard Type D air conditioning units, companion to Kennard/Nelson "Better Air" Type A line. Designed for competitive installations, Type D units available in wide range of sizes and arrangements, vertical and horizontal. Complete preselection of air cleaning components and accessories.
American Air Filter Co., Inc.

47—Multi-Drive Compressors

Bulletin 790 contains complete specifications and easy-to-use rating tables of the multi-drive line of air conditioning and refrigeration compressors and condensing units. Direct drive, semi-hermetic and belt drive units are covered. Cutaways and engineering data helps engineer to readily select proper unit.
Dunham-Bush, Inc.

48—Steam Unit Heater Test Code

AMCA Bulletin 20 is a new Standard Code for testing axial-type steam unit heaters. It establishes uniform test methods and serves as a standard for developing performance ratings under the AMCA Certified Ratings Program. Includes definitions, descriptions of apparatus, and improved test procedures.
Air Moving and Conditioning Ass'n, Inc.

49—Packaged Liquid Chillers

Four new catalogs cover a redesigned line of B&G water chillers. Catalog GPLC gives features and design characteristics; TPLC contains specifications and ratings on 7½ to 15 ton *Unibilt* chillers; SUPLC gives specifications and ratings on 20 to 75 ton units; DUPLC describes dual units, 69 to 150 ton.
Bell & Gossett Co.

50—School Air Conditioning

Bulletin 76-8908 explains how a school can be completely air conditioned for less money than if not air conditioned. Case histories including plans and photographs are detailed. Report on logic behind air conditioned schools and many advantages outlined. Many testimonials as proof of advantages are included.
Minneapolis-Honeywell Regulator Co.

51—Return Air Vent Silencers

Bulletin 2000-M88 describes *Aircoustat* vent silencers, a sound trap used in preventing the transmission of noise from one area to another. Typical installations are diagramed. Complete sizes and dimensions for all models are given. Installation data, performance chart, and chart of pressure drops between areas.
Koppers Co., Inc.

52—*Electronic*® Control Centers

Advantages and types of *Electronic*® control centers for air conditioning and heating systems are described in booklet F-8031-1. Graphic, selectronic, and identification centers for commercial and industrial buildings detailed. Flexibility explained and illustrated. Check list for control center planning.
Barber-Colman Co.

53—Cooling Coils

Bulletin 11 describes Marlo direct expansion and water coils of the serpentine type. Information includes design features, construction, and types of cooling coils available. Dimensional data for water and direct expansion coils include diagrams, and tabular dimensions. Other Marlo products are illustrated.
Marlo Coil Co.

54—Food Service Cooling, Heating

Bulletin 669 describes *Snopan* and *Colplate* for refrigerating food on counters and in storage and also *Steempan* and *Panelcoil* for steam tables, bain maries, plate warmer cabinets, shelf warmers, kettles, water heaters, other uses. Illustrations show construction and applications. Data on specifications needed.
Dean Products, Inc.

55—Control Centers

Publication 1040 describes the latest developments for centralized control of air conditioning, heating, and ventilating systems. New modular units include equipment for data collection, indication, recording, motor control, digital indication, data logging, alarms, and intercommunication. Illustrated.
Johnson Service Co.

56—Copper-Alloyed Galvanized Steel

Bulletin WC-255 describes the ultimate in galvanized sheets for air conditioning ducts and other applications, *SofTite Cop-R-Loy* galvanized sheets. Description of product, how and where it has been used, its manufacturing process, and other subjects are covered in detail with words and photographs.
Wheeling Corrugating Company.

57—Unit Air Conditioners

New publication 602-1 illustrates and describes Nesbitt *Roommate II*. Complete details on outstanding features, selection and application included. Capacities and specifications in easy-reference tabular form. Nesbitt *Humid-a-Guard* Control System, exclusive with *Roommate II*, also described.
John J. Nesbitt, Inc.

BUILDING MATERIALS

58—Metal Lath and Accessories

Catalog 202 contains illustrations, installation details, load tables, descriptions, and product data on lathing and plastering accessories for *Milcor* firesafe construction. Includes *Milcor* access doors, *Milcor* interior metal trim and products for use with acoustical plaster and tile. Fully illustrated.

Inland Steel Products Co.

59—Heating and Ventilating Ducts

Catalog 300 is the master catalog of *Milcor* sheet metal products. It presents detailed descriptions, installation information, sizes, weights, and packing on *Milcor* heating and air conditioning products, *Milcor* ventilators, *Milcor* roof drainage products and *Milcor* building specialties.

Inland Steel Products Co.

60—Insulated Wall Panels

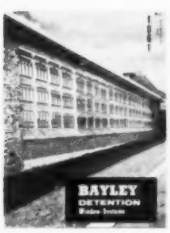
Catalog 243 describes Inland's line of insulated, non-load bearing wall panel systems and uninsulated siding. The eight-page folder includes selection data, physical properties, construction details and suggested architectural and engineering specifications. Erection procedures are illustrated.

Inland Steel Products Co.

61—*Tufcor* Roof Deck System

Catalog BT-603 describes the *Tufcor* concept of roof design. A deep corrugated, galvanized steel sheet. *Tufcor* provides a roof system with a vapor barrier on the warm side and a base and bond for lightweight, insulating concrete. Fire-resistant and economical. Illustrated with photographs and drawings.

Granco Steel Products Co.



62—Detention Windows

Catalog D-61 describes the complete Bayley line of especially designed detention window systems for penal and mental institutions. Shown are types best suited to various degrees of detention and individual preferences as to fenestration and ventilation. Complete details of design and construction.

William Bayley Co.

63—Insulated Metal Curtain Walls

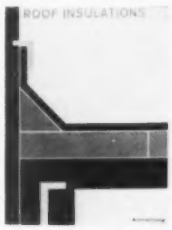
Catalog W-61 describes Mahon's insulated metal curtain walls and Underwriters' rated fire walls. Advantages of various types of metal wall given. Illustrated with line drawings and cutaways. Curtain wall load tables, complete specifications, and erection details. Typical construction details.

R. C. Mahon Co.

64—Fluid Roofing Material

Catalog R1-6-1260B fully describes a new and revolutionary elastomeric roofing material, designed especially for roofs of unusual design or configuration. This roll-on, plastic roofing is available in many colors. Advantages are outlined and illustrated. Step by step application of Armstrong F/A roofing in pictures.

Armstrong Cork Co.



65—*Temlok* Roof Insulation

Bulletin R1-S-61G contains complete information and specifications for Armstrong *Temlok* roof insulations. Describes insulating efficiency, strength characteristics, and physical properties. Charts and tables help you determine the amount of roof insulation needed. Complete installations procedures shown.

Armstrong Cork Co.

66—Fire Guard Acoustical Ceilings

This kit contains catalogs and specification data on the complete line of fire protective ceilings by Armstrong, including the new Acoustical Fire Guard Lay-in system. Perspective and elevation drawings are included. Both tile and lay-in systems have been tested and rated by Underwriters Laboratories.

Armstrong Cork Co.

67—Spring Assisted Access Doors

Catalog describes horizontally hinged *spring-assisted* access doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, flush floor doors, sidewalk doors, basement doors. Specification outlines materials, prices, and weights. Line drawings show operation. Sales offices listed.

BILCO Co.

68—Rolling Door Motor Operator

Bulletin 111 is a complete catalog on new power operator for motor operation of metal rolling doors manufactured by Kinnear. Includes complete specifications, dimensional data and outlines the advantages of power operation for heavy doors. Describes line of accessories and types of operating controls.

Kinnear Manufacturing Co.

69—Roof Decks

Booklet issued by The Flintkote Company, *Insulrock* Division, asks and answers 20 questions regarding *Insulrock*. What it is, how it is used, how it is applied, where it can be used, and many other pertinent questions are answered. Contains photographs of installation procedure and many applications.

Flintkote Co., Insulrock Division.

BUILDING MATERIALS *continued*

70—Precast Concrete Curtain Wall

Four-color brochure illustrates the unusual flexibility and wide range of effects that can be achieved through use of Marietta precast concrete curtain wall panels. Describes panel types, textures, and colors available. Includes construction details, specifications, and drawings.

Marietta Concrete Division
American-Marietta Co.

71—Colored Asbestos-Cement Sheets

Bulletin describes "K&M" *Asbestos-Cement* structural sheets in *Kolor-Mate* colors developed exclusively for Keasbey and Mattison. Sheets have basic asbestos-cement virtues, durability and freedom from maintenance. Colors won't blister, peel, fade, or yellow. Won't crack or chip during installation of sheets.

Keasbey & Mattison Co.

72—Steel Roof Decks

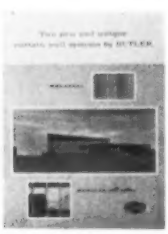
Bulletin WC-241 outlines 21 important advantages of Wheeling's two new styles of roof decks, narrow and wide rib. Load tables, suggested specifications, and other technical data included. Bonderized *Super-Rib* decks are roller painted, then supplied in unlimited lengths, 2′-0″ widths. Used also for wall panels.

Wheeling Corrugating Co.

73—Glass Protected Smokestacks

Bulletin SS-210 contains facts on glass-protected smokestacks pertaining to special applications, operating temperature ranges, assembly and erection procedures. Also comparative maintenance figures against steel stacks. Installation photographs, special sections, and accessories. Shipping weights and sizes.

A. O. Smith Corp.



74—Curtain Wall Systems

Bulletin 1951 describes Butler's two new insulated curtain wall systems, *Monopanl* and *Modular,* for use with commercial, industrial, and community buildings. Contains diagrams of construction and photographs showing installation procedures. Weight tables and span tables as well as application photographs.

Butler Manufacturing Co.

75—Mineral Tile Ceilings

Bulletin SC-232 describes United States Gypsum's *Acoustone* patterns for ceilings sculptured in mineral tile. Illustrations show various patterns. Contains information on sizes, light reflection, methods of installation, colors, washability, paintability, and resistance to soiling. Gives sound absorption coefficients.

United States Gypsum.

76—Color-Coated Steel Panels

Bulletin 60-1-258-Rev. describes Stran-Satin the color-coated ribbed steel panels. Panels in nine basic colors shown together with suggested color combinations. Colors prove functional and protective as well as pleasant and smart. Shows how these factory-applied, protective coatings are baked on layer after layer.

Stran-Steel Corp.

77—Steel Roof Deck

Catalog D-601 describes and illustrates how flint-hard enamel finish resists abrasion and corrosion. Advantages, specifications, load-tables, illustrated details, and installation procedures also shown. Wide rib makes welding easy; provides strong working platform. Illustrated with photographs and line drawings.

Granco Steel Products Co.

78—Steel Windows and Doors

Catalog S-61 describes the complete line of Bayley Steel Windows, including Bayley original features. The booklet includes such items as projected windows, pivoted windows, classroom and ribbon windows. Also included are detention windows. Dimensions, construction, design, fasteners, and finish.

William Bayley Co.

79—Rolling Steel Doors

Catalog G-61 describes rolling steel doors, grilles, and shutters manufactured by the R. C. Mahon Company. Various types of slats are pictured along with Mahon's special weathering features. Operation explained in text and illustrated in line drawings and photographs. Complete specifications with dimensions.

R. C. Mahon Co.

80—Spring Assisted Doors

Scale detailed drawings of horizontally hinged *spring-assisted* doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, floor doors, pit doors, and basement doors with steel stair stringers. Specifications, standard sizes, and weights included. Sales offices in this country and Canada listed.

BILCO Co.

81—Metal Rolling Doors

Bulletin 104, 36 pages, is a complete catalog of the many types of doors made by Kinnear. It gives information on the types of operations, both manual and electrical; elevation drawings, mounting methods for various applications and locations; specifications; and explains special construction features of these doors.

Kinnear Manufacturing Co.

COMMUNICATION & SIGNAL EQUIPMENT

82—Hospital Signaling Systems

Bulletin GE-574 describes the Edwards line of hospital signalling equipment, including nurses call systems, psychopathic alarm systems, in-and-out registers, silent paging systems, and annunciators. Complete with specifications, catalog numbers. And typical wiring diagrams. Fully illustrated.

Edwards Co., Inc.

83—Automatic Nurses' Call System

New bulletin 8035 on hospital communications describes the most wanted services: nurse-patient-staff communications; automatic monitoring of patients' rooms plus multichannel music/program distribution systems. Includes full description and illustrates various components. Lists typical users.

DuKane Corp.

84—Sound Systems Chart

Central Sound Systems pictorially illustrated on large 17″ x 22″ wall chart. Ten models shown, from turret type to the largest console, with available features and functions briefly outlined. Specifications covering a popular dual channel console, as well as typical general specifications are included.

Rauland-Borg Corp.

85—Cathodic Protection Cables

Bulletin RU-2-56 is of interest to public utilities, industries maintaining buried pipe or equipment, shipyards, oil and petroleum companies and others. Discusses advantages and gives engineering data on 2 types of these cables offered by General Cable Corporation. Includes complete specifications.

General Cable Corp.

86—Multiple TV Systems

Bulletin M-50-49 describes the Blonder-Tongue *Masterline* equipment for multiset operation in master and community TV systems. Consists of the main folder, an article on installing master TV systems in motels, catalog sheet of specifications, and price list. Bulletin is illustrated, includes amplifier specifications.

Blonder-Tongue Laboratories, Inc.

87—Clocks and Signals

New engineers' and architects' catalog contains general descriptions, illustrations, specifications, and complete details on time and program systems (electronic, synchronous wired, *Autoset* impulse); clocks (secondary, synchronous, wall, double-faced, tower, special designs); signal equipment.

Stromberg Div. of General Time.

88—Public Address Systems

New catalog SWC 17e/AL dsecribes and shows examples of Altec's sound system building block flexibility. Each specialized component illustrated in the catalog is designed to work in complete harmony with every other item in the Altec line: microphones, amplifiers, preamplifiers, loudspeakers, and horns.

Altec Lansing Corp.

89—Coded Paging Systems

Bulletin A-2-1260 describes Autocall's modern paging system designed to save time and money. Many advantages of this system are dramatically told in illustrations. How the system works is related in detail. Types of stations are pictured and described. Wide variety of audible signals are listed.

Autocall Co.

90—Security Alarm Systems

Four Circulars describe types of proprietary security alarm systems for all classifications of buildings and property. Protection against vandalism, forced entry, and unauthorized presence is now available. Each circular explains a security system and its application; *Radi-Matic* Barrier, Alarm and Sentry Unit.

Powers Regulator Co.

91—Underfloor Duct Systems

Catalog 517 describes Cope systems for power, telephone, and intercom wiring distribution. Includes the latest design Cope service fittings. Detailed diagrams show standard duct and double capacity duct. Junction boxes and accessories, as well as floor plans and service fittings are pictured. Installation photographs.

T. J. Cope, Div. of Rome Cable Corp.

92—Modular Sound Select-a-Guide

Bulletin 3J3668 is fold-out brochure which describes plan and functions of the new RCA Modular Sound Systems. Systems feature a variety of standard assemblies suitable for mounting in any of five basic cabinet units, enabling you to select the exact combination of sound functions and controls you require.

Radio Corporation of America

93—Supervisory Annunciators

Section S covers industrial annunciators designed to give instant visible and audible alarm in any abnormal situation. Used to prevent costly breakdowns in machinery or vital services, the annunciators detect trouble before serious damage results. Full descriptions and dimensions of both drop and lamp type.

Auth Electric Co., Inc.

COMMUNICATION & SIGNAL EQUIPMENT *continued*

94—Industrial Lamp Annunciators

Bulletin A-200 describes Edwards' new line of industrial lamp annunciators, which indicate visibly and audibly any abnormal condition in an automated or process system. Line features modular plug-in circuits and data logging or auxiliary control terminals. Includes selector chart, dimensions, components.

Edwards Co., Inc.

95—School Communications Systems

Bulletin 8047 briefly describes and completely illustrates two styles and four models of new DuKane school communications systems. Compact line provides intercom and program service including AM-FM tuner and 4-speed record player, all controls including emergency service.

DuKane Corp.

96—Private Telephone Systems

Product catalog, Section IX, describes Stromberg-Carlson's Dial-X private internal telephone communications systems. Every component is fully illustrated and described to show how it can be applied in 10-line, 20-line, and 40-line systems. Applications, specifications.

Stromberg-Carlson, Commercial Products Division of General Dynamics Corp.

97—Motel-Hotel Music Systems

Bulletin 51-L60 illustrates music and program distribution equipment for hotels and motels. A system with 5 channels of AM, FM or Hi Fi programs is described. Paging or alarm is included. Guest room selector panels for wall or table mounting may include "*Message at desk*" light and jack for intercom.

Rauland-Borg Corp.

98—Mining Cables

Bulletin PP-5-61 contains engineering information on the construction and characteristics of popular types of mining cables, as well as a listing and illustrations of other types of General Cable products for mining use. Cutaways show construction and photographs illustrate use. Complete specifications.

General Cable Corp.

99—Time Recording Systems

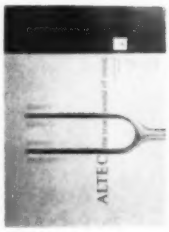
"First quality for Timing Accuracy" contains general description of electronic, synchronous wired, and *Autoset* impulse time and program systems with illustrations of the master time control, secondary clocks, and signals. Also illustrated and described briefly are attendance time recorders, job cost recorders.

Stromberg, Div. of General Time.

100—Master TV System Manual

Master TV manual written especially for engineers designing master antenna signal distribution. Shows components used in master TV systems, engineers' specifications, glossary of terms, charts, and tables. Section contains information on how to calculate electronic signal gains and losses. Wiring diagrams included.

Blonder-Tongue Laboratories, Inc.

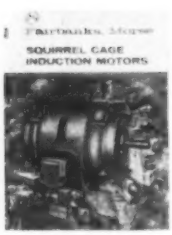


101—Stereo and Hi-Fi Music Systems

Altec's new catalog AL 1302-1 features illustrations of custom stereophonic and monophonic installations. A special feature is the selection which diagrams the proper placement of speakers and other components in a room. All components are described in detailed technical information and specifications.

Altec Lansing Corp.

ELECTRICAL APPARATUS



102—Squirrel Cage Induction Motors

Publication AEB450.6 describes the rerated line of F-M dripproof guarded motors in NEMA frames 182 through 445U. Motors are available in all mechanical and electrical types, either multispeed, high torque or intermittent duty. Cutaway shows construction and components are pictured.

Fairbanks, Morse & Co., Electrical Div.

103—Fuse-Fuseholder

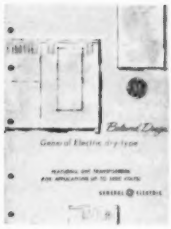
New Buss fuse-fuseholder combination for protection of individual fluorescent fixtures and other equipment on circuits of 300 volts or less. Bulletin SFH-6 tells how individual fusing reduces hazards of fires and explosions. Bulletin specifies the size fuse to use and where to locate it for the best protection.

Bussmann Mfg. Div., McGraw-Edison Co.

ELECTRICAL APPARATUS *continued*

104—Transformers

Bulletin 61B6186C contains small power, network, instrument, and distribution transformers for industrial and utility application. Each type of transformer is fully described and illustrated in this bulletin stressing some of the outstanding features and various applications. Current and potential transformer sizes.
Allis-Chalmers.



105—Distribution Centers

Bulletin GEA-6928 describes GE's dry-type integral distribution centers featuring QHT transformers for applications up to 5000 volts. Installation instructions, features, dimensions and cable space, selection data, ratings, and panelboard components are included. Material specification form helps you specify.
General Electric Co.

106—Industrial Capacitors

Booklet B-7642 contains 12 pages of easy-to-digest descriptive information on Westinghouse Capacitors, power factor correction and selection and application. This booklet can be of value in explaining the uses for capacitors to a client as well as an aid to selection and specification work.
Westinghouse Electric Corp.

107—Pressure Contact Switches

Square D *Bolt-Loc* switches, designed primarily for heavy-duty service entrance applications, are described in Bulletin SD-136. Bulletin also explains other applications, provides performance test results, and dimensions. *Bolt-Loc* switches are available in ratings from 1200 to 4000 amperes, 240 to 600 volts.
Square D Co.

108—Group Operated Switch Tests

Bulletin DB-1240-2 is a companion piece to Bulletin 1240-2a. Comparison of electrical and mechanical properties between new 3″ insulators and the old standard 5″ insulators in tabular form. A series of tests are reported giving purpose, procedure, results, and conclusions. Photographs and drawings.
I-T-E Circuit Breaker Co.

109—Synchronous Motor Controls

Bulletin 6092 deals with starting and speed regulation of low voltage wound rotor motors, up to 600 volts. Cutaway shows construction and components. Advantages are outlined in detail. Includes photographs and wiring diagrams. The Allen-Bradley line of synchronous starters illustrated and described.
Allen-Bradley Co.

110—Wiring Devices and Fuses

This six page bulletin lists federal specifications with which Eagle wiring devices and fuses comply. Conveniently listed as to style number, type number. Covers Federal Specifications numbers WC-596, WL-142, WR-151a, WR-00151b, WF-791b, WF-803A, WS-890, WS-893a, WS-896a, and MIL-F-15160c.
Eagle Electric Manufacturing Co., Inc.

111—Sectional Terminal Blocks

Catalog 76 features Buchanan sectional pres-*SURE*-blocks. Catalog includes technical data, engineering specifications, drawings. Shows modular construction, assembly ease, wire grouping, 3 types of contacts. Also covers one-piece terminal blocks, solderless connectors, one-piece squeeze-type connectors.
Buchanan Electrical Products Corp.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

112—DC versus AC Testing

Summary of non-destructive testing of full production lengths of cable in a cable factory plus laboratory test data and field testing. Discussion includes location of insulation imperfections, evidence to cause of failures, testing after installation and merits of both methods of testing. Bulletin 712.
Rome Cable Division of Alcoa.

113—Panelboard Circuit Breakers

Bulletin 3103 covers the Heinemann series 0911, an economical panelboard circuit breaker dimensionally interchangeable with other makes. Available in 1- and 2-pole models, 0.050 to 60 amperes, the 0911 uses hydraulic-magnetic actuation to end heat-induced nuisance tripping. Fast short-circuit interruption.
Heinemann Electric Co.

114—Motor Selection Guide

Bulletin 1024 was designed to assist consulting engineers in the selection of suitable motors from ⅛ to 10,000 hp for specific installation on original equipment, in commercial buildings and industrial installations. AC induction motors are outlined. A number of mechanical variations are shown.
Fairbanks, Morse & Co.

ELECTRICAL APPARATUS *continued*

115—Protective Fuses

Bulletin HCS tells how Buss *Hi-Cap* fuses have unlimited interrupting capacity on any voltage up to 600 to provide safe protection for loads above 600 and up to 5000 amperes. Describes operating characteristics and advantages, illustrates dimensions, contains charts on current limiting effect and opening times.

Bussmann Mfg. Div., McGraw-Edison Co.

116—Selecting Power Fuses

Data Bulletin 265 gives step-by-step method of selecting high-voltage power fuses for switching centers, substations, and service entrances. Method covers interrupting ratings, ampere rate selection, coordination, preloading adjustments, ambient adjustments, cooling time, and overload.

S&C Electric Co.

117—Squirrel Cage Induction Motors

Bulletin 201 covers Ideal Type "AP" squirrel cage induction motors rated from 25 to 1500 rpm and 514 to 1800 rpm designed for centrifugal blower, compressor, and pump applications. Complete performance data, emphasizing operating characteristics and construction features. Includes typical installation data.

Ideal Electric & Mfg. Co.

118—Ambient Compensated Relays

Engineering bulletin describes new A-H ambient compensated O.L. relays, the only devices now available that compensate automatically for both heat and cold. Operate on same time curve from –20°F to +165°F. Require no adjustment. Advantages, operation, and heater tables. Drawing shows construction. Photographs.

Arrow-Hart & Hegeman Electric Co.

119—Terminating, Splicing Fittings

"O.Z. Terminating and Splicing Fittings for Interlocked Armor Cable," 36-page engineering bulletin 135A, gives complete specifications, dimensions, cutaway drawings, photographs, and installation instructions. Prices and weights also are given for each item, along with ordering data and available materials.

O. Z. Electrical Mfg. Co.

120—Industrial Standby Plants

Four-page folder 4C-ON provides information on the selection of Onan standby electric plants and controls for industrial uses. Dramatizes need for emergency power in industrial applications. Lists choices of units, fuels, and starting methods. Includes data on L.T. Controls and Onan's inverter power unit, *Instapac*.

ONAN Div. of Studebaker-Packard Corp.

121—Disconnect Isolators

Bulletins 138 and 140 describe isolators which are extremely compact switching devices for the 5 to 15 kv range. Unique telescoping action requires one third of space needed by equally rated knife-type switches. Included are complete specifications and directions on how to order. Completely illustrated.

James R. Kearney Corp.

122—Electrical Wiring Devices

Catalog 60, 75 illustrated pages, describes complete range of electrical wiring devices. Both the interchangeable Despard line and the P&S conventional line. Everything from switches to fixtures to devices for every purpose are listed. A 15-page index and price list are also included in this catalog.

Pass & Seymour, Inc.

123—Saturable Reactors

Bulletin 658 describes Sorgel's saturable reactors, to regulate and control electric power for various manufacturing processes. Reactors from 15 kva to 470 kva are pictured. Typical single phase reactor circuit shown. Enclosed is a sheet listing required information for quotation on saturable reactors.

Sorgel Electric Co.

124—Remote Control Switches

Catalog 57-S2R1 describes the ASCO line of electrically operated, mechanically held remote control switches for the control of power, lighting, or mixed loads. Information covers selection, design and application data as well as pricing. Various construction details are illustrated. Wiring diagrams.

Automatic Switch Co.

125—Circuit Breaker Panelboards

Bulletin SD-126 defines panelboard quality requirements, describes complete line of Square D circuit breaker panelboard types and applications. Functional requirements of different voltage systems as well as special features are discussed. Selection tables for both panelboards and circuit breakers included.

Square D Co.

126—Low Voltage Equipment Buy Log

Buyers guide GEC-1100C, for service entrance equipment, circuit breakers and enclosures, safety switches, panelboards, busways, switchboards, motor control centers, sectional distribution centers, trolley busway, current limiting fuses. Photographs, application data, and prices.

General Electric Co.
Circuit Protective Devices Dept.

ELECTRICAL APPARATUS *continued*

127—Wiring Diagrams

New 40-page Bulletin SM-304 contains 150 diagrams covering various wiring arrangements of Square D contactors, starters, relays, and other devices. Bulletin also includes companion schematic diagrams plus diagrams for typical control circuits. Standard elementary wiring diagram symbols are provided.

Square D Co.

128—Outdoor Air Switch

Bulletin 1240-2A describes I-T-E's TTR-6, a vertical opening, group operated, outdoor air switch. This all-new aluminum switch has been designed for weight reduction, and to maintain electrical and mechanical characteristics. Cutaway shows construction. Electrical, mechanical properties in tabular form.

I-T-E Circuit Breaker Co.

129—Wound Rotor Motor Controls

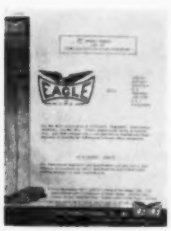
Bulletin describes starting and speed regulator equipment for low voltage wound rotor motors, up to 600 volts. Contains details of outstanding features, complete specifications, ratings, dimensions, prices, and information required when ordering. Various types of controls and cabinets illustrated.

Allen-Bradley Co.

130—Fused Switch Protection Report

Bulletin GET-2777 reports tests conducted at a General Electric Laboratory. Fused safety switches and heavy duty interrupters were subjected to 200,000 amp short circuits, and performed without fault. Describes method of testing, test conditions, and findings.

General Electric Co.
Circuit Protective Devices Dept.



131—Comparative Catalog Numbers

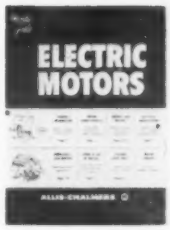
This 12 page bulletin is a speed-check list of comparative catalog numbers, listing the most commonly used wiring devices by manufacturers name. Devices of like function, manufactured by Eagle Electric Manufacturing Co., are cross referenced to Eagle catalog numbers. This is convenient of daily use.

Eagle Electric Manufacturing Co., Inc.

132—Corona Level Measurements

Bulletin RCT 711, reprint of conference paper, discusses detectors, standards and sensitivity, equipment installation and operation, testing techniques, field testing, future development and applications and I.P.C.E.A. test procedure on insulated cables. Photographs show testing equipment.

Rome Cable Division of Alcoa.



133—Electric Motors

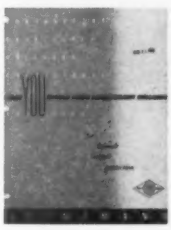
Consultants will find this a handy reference to help select the motor best suited to a particular drive. This catalog 51C6052Y contains a complete line of polyphase squirrel-cage and wound-rotor induction motors for every industrial use. Includes synchronous and *Synduction* motors to meet many applications.

Allis-Chalmers.

134—Pre-Insulated Splicing

Bulletin 2002-A-9160 features easier, quicker, surer splicing with Buchanan pre-insulated splice caps. The four-page brochure describes the Buchanan wide-range 2002 Splice Cap, ratchet-controlled P50 and C50 tri-*SURE*-tools and the exclusive three-indent rolling action crimp. Lists representatives.

Buchanan Electrical Products Corp.



135—Circuit Breakers

"What You Should Know About Circuit Breakers for Branch Circuit Protection," 16-page manual 101, describes ways of protecting your client from fire, equipment damage, excessive wiring costs, and needles circuit interruptions. How hydraulic-magnetic circuit breakers provide this protection is pointed out.

Heinemann Electric Co.

136—Electric Generating Plants

Bulletin F-146 describes the complete line of Onan electric plants, including gasoline and Diesel models. Lists 45 basic models. Easy-to-read specifications make it simple to select the proper type of generating plant for all needs. Chart of representative models outlines capacity, model, and voltage.

Onan Div. of Studebaker-Packard Corp.

137—Grounding Facts Booklet

Latest facts on National Electric Code requirements. Picturing and describing typical 15 amp, 125 volt; 20 amp, 125 volt; 20 amp, 250 volt and 30 amp, 125/250, 50 amp, 125/250 volt grounding installations. Included is a configuration and voltage chart showing the approved receptacle openings.

Arrow-Hart & Hegeman Electric Co.

138—Electrical Engineering Catalog

Catalog 135 is an engineering catalog covering conduit fittings, cable terminals, cast iron boxes, solderless connectors, power connectors, grounding devices, and interlocked armor cable fittings. Each device is completely described and illustrated in photograph and line drawing. Section of useful engineering data.

O. Z. Electrical Mfg. Co., Inc.

ELECTRICAL APPARATUS *continued*

139—Dry-Type Transformer Guide

Bulletin GEA-6907 is a specifiers' guide giving complete information on dry-type transformers, including data on how to select and apply; sound levels and construction features; application and ordering information. Described are general purpose transformers, autotransformers, buck-and-boost, stabilizing transformers.

General Electric Co.

140—Automatic Transfer Switches

Newly revised Catalog 57-S1R1 provides complete information (including pricing) on mechanically and magnetically held automatic transfer switches. Information on selection, design and application data, Blackout Control Systems, 16 Accessory Features. Photographs show construction details. Also includes wiring diagrams.

Automatic Switch Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

141—"Rocker-Glo" Switches

Illustrated four-page brochure describes new *Rocker-Glo* switch by Pass and Seymour. It has a luminous button and operates silently. Available in 15 or 20 amp, 120/277 volts ac. It has easy-to-wire pressure or screw terminals. Comes in Despard type with strap or Despard interchangeable.

Pass & Seymour, Inc.

142—Low Speed ac Generators

Bulletin 510 describes Ideal's low speed engine-type ac generators rated from 10 to 10,000 kva at 80 to 450 rpm. Construction features are outlined and illustrated. Typical installations pictured. Advantages are listed. Special applications. Map shows locations of representatives and service facilities.

Ideal Electric & Mfg. Co.

143—Distribution Load Break Switch

Bulletin 8C describes Kearny's ARI-60 Interrupter Switch featuring ARC-KO interrupter unit for high speed, dependable, and repeated circuit interruption. Photographs show operation and components. Cutaway details construction. Results of performance tests included. Includes ratings and dimensions.

James R. Kearney Corp.

144—Multi-Metering Devices

Bulletin SL-27 describes Square D meter-breaker units and enclosures, service entrance terminal boxes and accessories. Bulletin also shows how Square D's *E-Z* Stack design simplifies multi-metering installations, and illustrates suggestions for mounting 5 to 24 meters in a modular arrangement.

Square D Co.

145—Basic Electrical Protection

Booklet PBP, just released by the makers of Buss fuses, explains such terms as interrupting capacity, speed of response, and current limitation. Valuable information on motor protection, system selectivity to faults, fuse application, and fuse selection is given. Charts show time of opening and current limitation.

Bussmann Mfg. Div., McGraw-Edison Co.

146—Transformers and Substations

Bulletin 960 describes engineering and installation advantages of Sorgel dry-type load center transformers and substations. Includes 15-point checklist in specifying transformer and substation gear. Equipment up to 10,000 KVA and for all voltages up to 15,000. Photographs, cutaways, performance curves.

Sorgel Electric Co.

147—Emergency Generating Sets

Bulletin 2900 describes the complete range of Fairbanks-Morse emergency generating sets. Includes gasoline, LP and other dry gas fuel units of 400 watts to 150 kw, and diesel units 3 to 2500 kw. Complete data selection tables outline various cycle, phase, and volt characteristics. Manual, remote control.

Fairbanks, Morse & Co.

148—Metalclad Switchgear

This 36-page brochure describes S&C metalclad switchgear. Application and performance, components, specifications, and accessories are described and illustrated. Photographs and diagrams show how metalclad switchgear is used in industrial distribution systems. Excerpts from 1959 National Electrical Code.

S&C Electric Co.

149—Super-Seal Motors

Many outstanding features of A-C's complete line of *Super-Seal* motors are described in detail in this colorfully illustrated bulletin 05-51B9040B. It also contains numerous cutaway drawings and photographs that clearly illustrate advantages of *Poxeal* and *Silco-Flex* motors available for many industrial applications.

Allis-Chalmers.

ELECTRICAL APPARATUS *continued*

150—Sealed Dry-Type Transformers

GEA-6790 describes new, lighter weight, aluminum wound sealed dry-type transformers rated 300 kva and above. Outlines major features of transformer and versatility provided by choice of three high-voltage terminations. Photographs, charts, design variations, weights and dimensions tables, and optional features.
General Electric Co.

151—Magnetic Motor Starters

Bulletin SM-293 covers Square D line of magnetic starters. New 8-page bulletin gives construction features of magnetic starters from NEMA Size 0 through Size 5, demonstrates installation, inspection and maintenance routines. Also describes field modification kits and variety of enclosures available.
Square D Co.

152—Explosion-Proof Housings

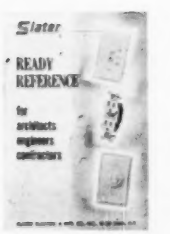
Bulletin 160 describes Adalet's complete line of cast-aluminum, weather-proof, and explosion-proof junction boxes and housings. Dimensions for all sizes and types are found in tabular form. Also included is a section on explosion-proof housings and one on explosion-proof control stations, pilot lights, and switches.
Adalet Manufacturing Co.

153—Cellular Steel Sub-Floors

Catalog M-61 describes Mahon's M-floor construction providing electrical raceways to serve every square foot of floor surface. Advantages listed and line drawings show sections of basic units. Cutaways detail construction. Photographs of installations and installation methods. Specifications, framing details.
R. C. Mahon Co.

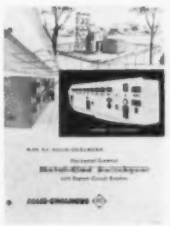
154—Automatic Transfer Switches

Bulletin IR-0033 on Zenith transfer switches in emergency power systems. Describes switches mechanically held in normal and emergency positions, mechanically held in one position and electrically held in other, magnetically or electrically held in both. Also details and diagrams on designing systems.
Zenith Electric Co.



155—Ready Reference Catalog

Compact 64-page catalog is a convenient reference for consulting engineers in the selection of wiring devices. Itemizes over 600 wiring devices including residential, intermediate and specification grades. Listings include the *Hi-Lo* dimmer for 2-stage lighting and the new *Hi-Lux* ultra compact rotary dimmer.
Slater Electric & Mfg. Co., Inc.



156—Metal-Clad Switchgear

Sales bulletin 18B6346D contains valuable information for Consultant planning which includes switchgear equipment. Detailed information on outstanding features are included along with numerous illustrations, sectional drawings, and operation-sequence photographs. Complete specifications and data.
Allis-Chalmers.

157—Bus Duct

A series of bulletins covering technical descriptions, ratings, dimension, test data, protective devices, and hangers. Bulletins 30-660-1-2-3-4 cover bus duct, plug-in bus duct, low impedance bus duct, high impedance bus duct, and electric utility bus duct. Illustrated with construction drawings and diagrams.
Westinghouse Electric Corp.

158—PVC Rigid Conduit

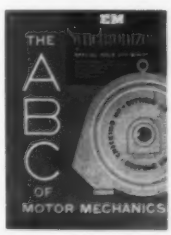
Bulletin KE 1058 is a new 20-page rigid polyvinyl chloride electrical conduit catalog. Included are comprehensive test results, specification information, installation instruction, corrosion resistant charts, and other valuable data. Illustrations show various types of pipe and fittings. Pictures show proper assembly.
Kraloy Plastic Pipe Co., Inc.

159—Silicone Rewind Savings

Bulletin R-10-215 reviews a case study showing how one company saved $5,000 in annual maintenance costs by specifying silicone insulated motors. Advantages of motors subjected to heavy duty cycles, shock loading, and high ambient temperatures are shown in a replacement analysis and cost comparison.
Dow Corning Corp.

160—Stationary Batteries

Bulletin 6444 describes *Exide-Ironclad* battery with tubulary-type positive plate, new design in stationary field. Saves up to 50% in space and weight over conventional types, lasts 20 years in float service. For telephone, microwave, fire alarm, electric utility, railway signaling, emergency light and power service.
Exide Industrial Division.



161—Manual of Electric Motors

A comprehensive technical treatise covering the design, testing, installation, and start-up of modern electric motors. There are sections on vibration, noise, ventilation, and maintenance. The 36 page book is profusely illustrated with up-to-date charts on methods and practical trouble shooting techniques.
Electric Machinery Mfg. Co.

ELECTRICAL APPARATUS *continued*

162—Pressure Contact Switches

Bulletin 101 describes Barkelew's *Bolt-Log* load break service entrance switches. Furnished in 1200, 1600, and 2000 amp capacities for 240, 480, and 600 volt 60 cycle ac service. Two, three, and four pole, fused or unfused, front or rear connection. Mountings, construction, dimensions, and tests included.

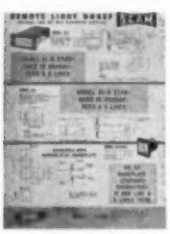
Barkelew Electric Mfg. Co.

163—Steel Electrical Raceways

Bulletin SPA-034-260 describes Buckeye and Yoloy steel electrical raceways for modern construction. Various types of conduit are illustrated. Chemical properties are given. Photographs show installation while buildings are under construction. Conform with the requirements of Underwriters Laboratories.

Youngstown Sheet and Tube Co.

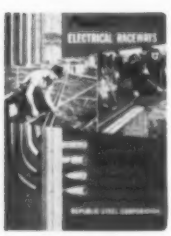
To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.



164—Remote Light Boxes

Bulletin LI describes and illustrates Scam's wide selection of light boxes. Complete dimensional drawings, electrical requirements, and character counts are given. Of particular interest are an individual light box with backlighted nameplate; the larger, new *Magna-Plac* nameplate; and remote lamp cabinets.

Scam Instrument Corp.



165—Electrical Raceways

Bulletin SA-EMT-61 describes types of electrical raceways including *Inch-Marked* electrical metallic tubing, Republic rigid steel conduit, *Dekoron-Coated* (plastic armored) E.M.T., and rigid conduit, plastic pipe, and E.M.T. bending tools. Exclusive features result in lower installation costs.

Republic Steel, Steel & Tubes Division.

166—Right-Angle Worm-Gear Motors

Bulletin F-1971 describes U. S. *Syncro-gear* Motors, right-angle worm-gear type, with diaphanous view and cutaways showing exclusive design features that make these motors rugged, dependable, economical in plant or OEM service. Speeds 3.25 to 230 rpm, gear ratios up to 87.1 (354 to 1 on Type GMB).

U. S. Electrical Motors Inc.

167—High Frequency Bus Duct

Bulletin B-7326 describes Westinghouse's revolutionary new method of transmitting high frequency power. Frequency range from 180 to 20,000 cycles with voltage drop of less than 1 volt per 100 feet. Installation procedures, typical applications, features and components are shown. Closeup shows construction.

Westinghouse Electric Corp.

168—Underfloor Duct System

Catalog 203 describes the Orangeburg underfloor duct system, non-metallic underfloor raceways for distribution of electrical wiring in commercial, industrial, and institutional buildings. Drawing keyed to index shows components, which are also pictured and described. Instructions for installation given.

Orangeburg Manufacturing Co., Inc.

169—Unit Substations

Bulletin TU-152 completely describes Wagner's unit substations. These are complete load centers available with oil-filled, non-inflammable liquid-filled, sealed dry-type or ventilated dry-type transformers. All standard switches, breakers and other accessories are supplied with indoor or outdoor enclosures.

Wagner Electric Corp.

170—Bus Duct

Bulletin XL-765 provides technical data, dimensions, catalog information, and layout procedures for BullDog's new plug-in bus duct which exhibits low voltage drop characteristics and has built-in safety features. Also contains dimensions and technical data on X100 bus duct.

BullDog Electric Products Division
I-T-E Circuit Breaker Co.

171—Insulated Wire and Cable

Everything needed for the selection, design, installation, and operation of Kerite insulated wire and cable for light, power, and control service. Leatherette portfolio is tab-indexed to cover cable description, capacity, testing, technical tables, terminals, splices, and miscellaneous data of value to the consulting engineer.

Kerite Co.

172—Cables for Power Circuits

Bulletin 1037 describes Simplex *Anhydroprene XX* cables for power circuits up to 600 volts, designed for service in ducts or conduits or as open wiring in buildings. The jacket is a balanced compound of neoprene and other ingredients which provides balanced resistance to sunlight, oil, acids, heat, flame, abrasion.

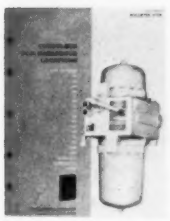
Simplex Wire & Cable Co.

ELECTRICAL APPARATUS *continued*

173—Duct Floors for Electrification

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development which provides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Steel Reinforcing Institute.



174—Condulets, Hazardous Locations

Bulletin 2722 "Condulets and the National Electrical Code" details applications of condulets in hazardous locations. More than 300 product and installation photographs. Drawings accompany the Code quotes. A valuable reference for planning electrical installations in hazardous locations.

Crouse-Hinds Co.

175—Emergency Power Guide

Booklet 40-20205-DN927 is Caterpillar's guide book for emergency power. Describes in detail the three sources of standby power – central battery systems, two circuit systems, and emergency generator sets. Details many advantages of diesel generator sets. Selection data of proper diesel for specific application.

Caterpillar Tractor Co., Engine Division.

176—Emergency Lighting Handbook

The purpose of this bound handbook is to make available to consulting engineers all pertinent information on 6-volt emergency lighting. Gives reasons, installation design, equipment, components of system, and maintenance. Specifications, National Electrical Code, Building Exits Code, and State Regulations.

Electric Cord Co.

177—Underfloor Wire Distribution

Catalog 492 describes Cope Headerduct, a modern method of underfloor wire distribution specially designed for coordination with cellular construction. Drawings show general assembly, blank headerduct, duct with handhole access unit, and capped opening duct. Headerduct accessories are pictured and described.

T. J. Cope, Div. of Rome Cable Corp.

178—Aluminum Conduit Fittings

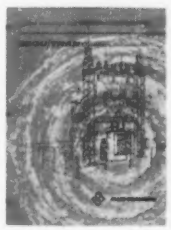
Catalog 59 lists, in condensed form, all types of aluminum conduit fittings made by Killark Electric Mfg. Co. Contains dimensional data of such items as circuit breakers, conduit bodies, connectors, explosion-proof vapor-tight and dust-tight fittings and fixtures. Catalog numbers keyed to separate price list.

Killark Electric Mfg. Co.

179—Electric Power Distribution

Catalog 90 for Consulting Engineers describes 60 ampere (continuous) and 90 ampere (intermittent) *Feedrail.* This system is made up of standardized units, factory-assembled for ease of installation. Design and construction are shown in cutaways. Advantages, typical layouts, and installation procedures included.

Feedrail Corp.

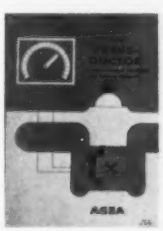


180—Compact Substations

Consultants interested in a new concept for distribution systems will find bulletin 61B9756 an important reference. New *REGU/TRAN* compact substation requires 25% less space than conventional substations resulting in lower installation costs! Describes and illustrates *REGU/TRAN's* many features.

Allis-Chalmers.

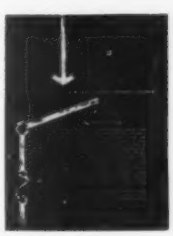
To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.



181—Load Cells for Heavy Industry

Booklet 7707E describes a Load Cell, the ASEA *Pressductor.* Utilizing the principle of permeability shift within a magnetic material under mechanical stress the *Pressductor* gives a high output varying linearly with increasing load. Drives an instrument or sensitive relay directly without intermediate amplifiers.

ASEA Electric, Inc.



182—Service-Entrance Equipment

Bulletin 601 deals with operating and safety requirements for service-entrance units. Covers manual operation, short-circuit and overload protection, arcing and single phasing. Gives equipment specifications. Includes illustrated section on operation of Pringle bolted-pressure load-break service-entrance switch.

Pringle Electrical Manufacturing Co.

183—Electrical Steel Sheets

Publication ADVL 118-54 is an engineering manual in a loose-leaf binder. The 286 pages describe silicon steel sheets for electrical purposes. Charts and tabulations contained therein represent expected characteristics. Contains information on types of curves, general discussion, and core losses. Applications.

U. S. Steel Corp.

ELECTRICAL APPARATUS *continued*

184—Specification Manual

New Manual SD-200 gives comprehensive specification data on Square D electrical equipment — safety switches, motor starters, panelboards, switchboards, dimmerboards, control centers, bus duct, and substations. The manual also contains convenient reference guide to National Electrical Code.

Square D Co.

185—Integral Unit Substations

GEA-7222 details expanded range of integral distribution centers rated 2500 kva and below liquid and dry types, including 4 incoming sections, 3 transformer sections, and choice of low-voltage equipment. Includes full description, installation details, weights, dimensions, photographs, charts, and drawings.

General Electric Co.

ENGINEERS' OFFICE & FIELD EQUIPMENT

186—Reproducing Unit

Bulletin A-2785 describes basic uses for the *Copyflex* diazo system in streamlining paperwork operations in business and industry, now available. Various techniques and applications are graphically described showing the versatility of *Copyflex*, and how it can reduce the paperwork barrier. Completely illustrated.

Charles Bruning Co., Inc.

189—Microfilm for Drawings

The Recordak engineering drawing program is a comprehensive system for reference, reproduction, and security of engineering drawings. New brochure 877D explains complete program and how this system meets recently released Department of Defense Specifications for drawings of defense contractors.

Recordak Corp.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

190—Aluminum Raised Floor System

Bulletin PW-360 describes the *Lupton* aluminum raised floor system designed to support electronic data processing equipment. Brochure illustrates special features of system and its installation. Supplementary information contains complete specifications. Main office, plant, and sales offices listed.

Michael Flynn Mfg. Co.

187—Reproducing Quality Whiteprints

Bulletin A-2803 describes the Revolute Meteor 60, a dry diazo type whiteprinting machine. The unit contains many advanced features, such as patented perforated rollers which assure complete development of prints even at top machine speeds. A big size whiteprinter with medium volume capabilities.

Charles Bruning Co., Inc.

191—Data Processing System

Describes the outstanding performance characteristics and processing opportunities presented to the engineering and research professions by the new expanded 1620, with storage increased to 60,000 positions and high speed punched card input and output. Component units illustrated.

International Business Machines Corp.

188—Blue Print Racks

Bulletin describes *Glider* blue print racks manufactured by Momar Industries. Advantages of using this equipment outlined. Models are illustrated together with accessory shelf, file cabinet, and extension racks. Detail photographs show direct-clamp action of plan holders. Also enclosed is price list of equipment.

Momar Industries.

192—*Thermo-Fax* Copying Machine

Bulletin TF-SQB illustrates and describes 10 different uses and applications for *Thermo-Fax* copying machines, and lists 50 other uses for specific departments. Each use is illustrated. Also includes a brief description of copy paper colors available and the new laminating film. Illustrated in full color.

Minnesota Mining & Manufacturing Co.

ENGINEERS' OFFICE & FIELD EQUIPMENT *continued*

193—Micro-Reproduction System

Bulletin MF-DODS is a brief discussion of the new standards and specifications of the Department of Defense engineering data micro-reproduction system. Uniform standards this system covers are listed. Aperture card formats are described and illustrated. Describes equipment standardization for uniformity.
Minnesota Mining & Manufacturing Co.

194—Drafting Room Equipment

Catalog GC-59 describes Stacor lifetime quality equipment for the drafting room. Includes flat drawer filing cabinets, roll files, all types of drafting tables, tracing boards and tables, other equipment. Cutaways and exploded views show construction and components. All equipment offered illustrated. Dimensions given.
Stacor Equipment Co.

195—Solid-State Processing System

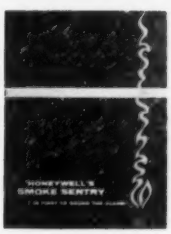
Booklet serves as a brief, compact introduction to the 7074 solid-state data processing system. Topics covered include modularity, speeds, and program compatibility with the 7070. Fast and economical. A list of programs available from the 7074/7070 programming library is also included.
International Business Machines Corp.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

FIRE PROTECTION EQUIPMENT

196—Vertical Fire Pumps

Bulletin 401 describes in detail Layne vertical fire pumps especially designed to pump from wells, reservoirs, lakes, rivers, or sumps. Multi-colored diagrams show operation of water and oil lubricated pumps. Sizes and capacities are charted. Fire pump accessories are diagramed in their proper assembly position.
Layne & Bowler, Inc.



197—Smoke Detector

Bulletin 76-9006 describes Honeywell's Smoke Sentry, a smoke detector which gives the alarm at the first wisp of smoke. Can be used as alarm system, system component, and control mechanism. Employs a light beam which will guard an area 30 x 160 feet. Various components are illustrated. Specifications.
Minneapolis-Honeywell Regulator Co.

198—Fire Hydrants

An AWWA compression type, dry head fire hydrant with swivel flange below nozzles, permitting nozzle section to be rotated 360° without removing bolts. Furnished with or without breakable flange and stem coupling. All parts removable thru inside of barrel. Bell, mechanical joint or flange pipe connections.
R. D. Wood Co.

199—Fire Alarm Systems

Catalog F249 comprises several bulletins in a binder completely describing *Flexalarm*, Gamewell's fire alarm systems. Bulletin F249A describes and illustrates the systems components; F249C gives complete specifications and circuit diagrams; 131 and 132 detail local fire alarm control cabinets. Special systems.
Gamewell Co.

200—Fire Alarm Systems

Catalog illustrates and describes Standard's March Time, Master Code, and Box Code systems. Also covered are supplemental pre-signal circuits, non-code continuous sounding bells and horns, code transmitters, control panels, stations, detectors, signals, and accessories. Specifications included.
Standard Electric Time Co.

201—Fire Alarm Systems

Section F-1 includes non-coded, supervised and unsupervised fire alarm systems, also coded systems for institutional, commercial and industrial buildings. The catalog illustrates and describes audible signals, detectors, control panels, and stations. Includes wiring diagrams, and specifications.
Auth Electric Co., Inc.

HEAT EXCHANGERS & WATER HEATERS

202—Multi-Zone Platecoil

This bulletin, 59-PI, describes and illustrates the new *Platecoil* configuration. It contains pertinent information on construction, application, and advantages in heat transfer. Specifications, size, weight, and surface area of standard units are listed. Varied applications are pictured and discussed.

Tranter Manufacturing Co.

203—Heat Exchanger Manual

This catalog contains an engineering section that provides the engineer with the means to make size estimates of heat transfer equipment. It helps the engineer to select a heat exchanger that will provide economy of service, precise operation, and long life. Contains thermal standards and reference data.

Condenser Service & Engrg. Co., Inc.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

204—Steam-Water Service Manual

Engineer's Manual offers diagrams and engineering details helpful in planning new systems or updating old ones for hot water storage heaters, fuel oil heaters, two-temperature hot water systems, heat exchangers for cooling, pressure reducing, hot water, instantaneous heat exchangers, jacket water cooling.

Powers Regulator Co.

205—Gas-Fired Water Heating Systems

A Guide to the proper sizing, selection, and installation of gas-fired water heating systems for all types of restaurants and cafeterias. Various types of dishwashing equipment are described. Basic information is furnished on water and gas piping, venting, and required clearances. Diagrams and cutaways.

American Gas Association.

206—Heat Exchanger Tubes

Anaconda bulletin 707 describes mechanical and physical properties and test results of new *Cupro Nickel* alloy specially developed for heat exchanger tubes in power plant feedwater heaters. This high-strength copper-nickel-iron tube alloy makes possible substantial operating economies. Sales offices listed.

Anaconda Co.

207—Hot Water Heaters

Bulletin 22 describes gas operated automatic hot water heaters manufactured by Ewing. Delivered with controls mounted in place for quick installation and immediate operation. A model for any application. A.G.A. and A.S.M.E. approved. Complete specifications include recovery capacities. Operates on all types of gas.

Ewing Manufacturing Co.

208—Platecoil Technical Data Manual

Bulletin 159, 48 pages, completely describes new *Multi-Zone Platecoil,* covering styles, dimensions, specifications, and operational data. Methods of calculating heat transfer equipment requirements are outlined. Typical installations are pictured and described. Available on request.

Tranter Manufacturing Inc.

HEATING & VENTILATING EQUIPMENT

209—Packaged Fan Units

Catalog 1160 Westinghouse's ventilating sets, packaged fan units ready to use. Typical applications are listed. Includes features, construction, velocity charts, performance tables, typical specifications, dimensions, and general application information. The units are illustrated together with component parts.

Westinghouse Electric Corp.

210—Low Silhouette Roof Ventilators

Catalog, 1961 edition, describes complete line of high efficiency gravity and power roof ventilators. Complete engineering and performance data cover rotary, stationary, directional, continuous ridge, and unit ventilators in the gravity series. Powered models include horizontal and vertical discharge types.

Western Engineering & Mfg. Co.

HEATING & VENTILATING EQUIPMENT *continued*

211—Tubeaxial Fans

New high-speed belted and direct-connected tubeaxial fans, designed around an 8-blade "Macheta" airfoil axial flow propeller, are illustrated and described in Bulletin 350. Top performance against medium pressures at speeds to 3450 rpm. Available in 16" and 18" diameters. Folder includes ratings and dimensions.

Aerovent Fan Co., Inc.

212—Centrifugal Fans

Catalog 1120-1 describes Westinghouse's all purpose centrifugal fans, Series 3000. Suitable for many applications such as supply and exhaust, general ventilation, industrial air conditioning, tunnel ventilation, and industrial processing. Text is completely illustrated with photographs, charts, and graphs.

Westinghouse Electric Corp.

213—Oil Burner Chimney Guide

Engineering data guide, EM-306, gives simplified calculation procedure for selecting chimney sizes for I.B.R. approved cast iron boilers. Included are sample problems, calculation procedures for multiple boiler installations, information on special conditions, and general recommendations.

Weil-McLain Co.

214—Roof Exhausters

Catalog SL 1-60 illustrates and describes the *Spun Line* of centrifugal roof exhausters, for either sidewall or direct drive mounting. Describes unit construction, heavy wall tubing structure welded into a rigid one piece frame, spun aluminum housings, and weather shielded vibration isolations. Specifications.

Greenheck Fan & Ventilator Corp.

215—Rehabilitating Heating Lines

Descriptive brochure illustrating procedures for restoring existing underground heat distribution systems to new construction efficiency. Before and after illustrations show metal conduit, split tile, concrete box, and hydrocarbon fill along with restoring procedures. List of rehabilitation jobs given.

Concrete Thermal Casings, Inc.

216—Flat-Oval Duct and Fittings

Flat-Oval duct and fittings designed for use where space limitations prevent the installation of circular duct for high pressure high velocity air systems. Sizes, complete set of matched fittings, pressure loss data and reinforcement to minimize amplitude of vibration and static pressure deflection are listed.

United Sheet Metal Co., Inc.

217—Air Supply and Exhaust Unit

Bulletin 552 describes Clarage's Twinalator. Both air supply and exhaust are handled simultaneously with one impeller. Requires only one motor, one roof opening, one drive, one starter. No separate make-up air unit necessary. Dimensions, capacity tables, and diagrams included. Installations shown.

Clarage Fan Co.

218—Belt-Driven Tubeaxial Fans

Bulletin 625, eight pages, describes Type BT and BTV tubeaxial fans in 30 to 60 inch sizes. Designed for handling high temperatures, corrosive and explosive fumes, abrasive dusts, dirt laden air, high humidity. Also lists general fan laws, data on system and open surface tank ventilation, and duct resistance.

Robbins & Myers, Inc., Propellair Div.

219—Duo-Service Heating Systems

Bulletin 22 describes combination heating and domestic hot water with small input boilers with sizing of the boiler on the heating load only. Duo-Service system comprises a Hydrotherm gas-fired cast iron boiler (50,000 to 125,000 input), all welded-steel Hydro-Tank, circulator and necessary controls.

Hydrotherm, Inc.

220—Large Area Gravity Ventilators

Bulletin LY-T60, a 6 page brochure features the *Linex* and *Litex* low silhouette, large area gravity roof ventilators. Included are engineering tables showing capacity selection, dimensions, weights, gauges and for the *Litex* a table on values on light illumination through fibreglas dampers.

Penn Ventilator Co. Inc.

221—Packaged Boilers

Bulletin 21 gives specification data on completely packaged boilers for gas-fired hot water installations. Factory assembled, piped and wired with circulator, expansion tank and built-in positive air elimination system, these 50,000 to 155,000 input packages are equipped with self-energizing controls.

Hydrotherm, Inc.

222—Centrifugal Fans

New Bulletin 70 contains complete information on Marlo centrifugal fans, available in 12 sizes from 8⅝" to 32½" diameter, circulating from 400 to 46,000 cfm AMCA certified ratings. The 16-page booklet includes construction details, plus performance tables and dimensional data on all 12 sizes of fans.

Marlo Coil Co.

HEATING & VENTILATING EQUIPMENT *continued*

223—Air Diffusers

Bulletin K27-A illustrates and describes linear and rectangular series air diffusers. Offered in three series – square, panel, long-slotted – units combine best air distribution and modern styling. Dimensional drawings for several types in each series provided. Complete selection and performance data, list of agents.

Connor Engineering Corp.

224—Industrial Fans

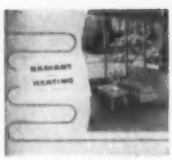
Bulletin L-5 describes Lehigh's line of industrial fans. Includes tables, specifications, photographs, and drawings. Rating tables show air volumes, rpm, hp at static pressures and outlet velocity and velocity pressures. Also correction ratios and fan laws.

Lehigh Fan & Blower Division, Fuller Company.

225—Electric Unit Ventilators

New catalog E10-1 presents complete data on the Nesbitt Electric *Syncretizer* and Electric *Wind-o-line* designed specifically for classroom applications. Data includes selection, application, schematic and detail drawings. Outstanding features such as packaged wiring in the unit and plug-in *Wind-o-line* described.

John J. Nesbitt, Inc.



226—Radiant Panel Heating

"Radiant Panel Heating with Steel Pipe," 48 pages, covers the history of this type of heating, basic design, floor, ceiling, and wall panels, information on snow melting systems, pipe coil integration, design of a floor coil system, and a boiler hook-up diagram.

Committee of Steel Pipe Producers, American Iron and Steel Institute.

227—Steam Heating Coils

Bulletin B-58 describes Non-Freeze and *Flexitube* steam heating coils of smooth fin construction that provides maximum temperature rise with minimum air friction. Higher face velocities can be utilized to reduce coil sizes over those formerly required. Contains necessary engineering data for coil selection.

Aerofin Corp.

228—Surface Unit Heaters

Catalog 956 describes *Grid* cast iron steam heat transfer surface unit heaters, blast heaters, and radiators. Describes and illustrates one-piece construction. Included are air distribution charts, heating capacities, conversion tables, and specifications. This four-section catalog with tab index is well illustrated.

D. J. Murray Manufacturing Co.

229—Propeller Fans

Bulletin 613 completely describes and illustrates propeller fans for either exhaust or supply service. Available in direct and belt drive. Capacities from 230 cfm to 34000 cfm. Large volumes of air at low static pressures and low power consumption. Includes construction features and specifications.

New York Blower Co.

230—Airfoil Centrifugal Fans

Catalog 1125 describes Westinghouse's Centriline, Series 200, airfoil centrifugal fan with in-line air flow. Advantages and applications are outlined. Includes arrangements, sound comparison curves, and performance curves. Illustrations include cutaway showing construction features. Complete engineering data.

Westinghouse Electric Corp.

231—Air Moving Devices Test Code

Bulletin 210 explains the Standard Test Code for Moving Devices, issued by the Air Moving and Conditioning Association Inc. Covers scope, definitions, test set-up and equipment, observations, calculations, and results. Includes tables, charts, graphs, and schematics. The purpose and major association activities outlined.

Air Moving and Conditioning Ass'n Inc.

232—Bifurcator Fans

Catalog DB-37-55, 16 pages, describes operation of the bifurcator fan, a split-housing fan that exhausts hot, corrosive, and flammable fumes. Use of the bulletin makes fan selection easy since it gives full data on fan laws and static pressure, velocity pressure, and friction.

DeBothezat Fans, Division of American Machine & Metals, Inc.

233—Fibre Duct

Bulletin 300 describes Sonoco's fibre duct, *Sonoairduct,* for slab-on-ground perimeter heating and combination heating and cooling installations. Gives features and advantages and method of installation. Pictures show how duct is laid before pouring slab. Includes detail drawings for perimeter heating.

Sonoco Products Co.

234—Compact Centrifugal Ventilators

Bulletin CV61 describes and illustrates new high performance advanced styled, low silhouette, centrifugal roof ventilators featuring aerodynamically designed extruded aluminum discharge vanes, quietness of operation, non-overloading horsepower, and a stable pressure curve. Capacities certified by AMCA.

Western Engineering & Mfg. Co.

HEAT EXCHANGERS & WATER HEATERS *continued*

235—All-Purpose Exhausters

Catalog 707 describes Clarage's new line of Type CI cast iron fans for general purpose industrial and commercial air handling. Handles volumes to 3800 cfm, pressures to 18 in., temperatures to 750°F. Built in 5 arrangements, 3 different wheel types, and 6 sizes. Arrangements and wheel types pictured.
Clarage Fan Co.

236—Direct-Connected Vaneaxial Fans

Bulletin 475 covers new Aerovent direct-connected vaneaxial fans, equipped with removable vane sections to facilitate installation and simplify routine cleaning and maintenance. Furnished in sizes 18″ to 48″ for capacities to 67,300 cfm, these high-efficiency units offer top performance against resistances to 6″ SP.
Aerovent Fan Co., Inc.

237—Power Roof Ventilators

Bulletin 680-C describes *Sky-Blast* power roof ventilators. Weatherproof features include corrosion-proof, aluminum alloy propeller; nonclogging dampers and rain-shed; one-piece all welded base hot-dip galvanized after fabrication. Automatic fire-vent release. Sizes to 60 inches; air deliveries to 78,000 cfm.
Robbins & Myers, Inc., Propellair Div.

238—Cast Iron Boilers

Catalog H-254 describes Weil-McLain's commercial and industrial gas, oil and combination gas/oil boilers. Net gas ratings to 3354 mbh (129.1 hp), net oil ratings to 2942 mbh (113.2 hp); ratings approved by Institute of Boiler & Radiator Manufacturers. Contains description, ratings, dimensions, and drawings.
Weil-McLain Co.

239—"Z"crete Insulating Conduit

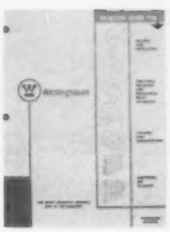
Design Data Booklet C-6 describes the features of permanent thermal efficiency for underground heat distribution piping using *"Z" crete* and Insulating concrete conduit. Includes construction sequence with diagrams, load study, typical conduit diagrams. Many other details are included.
Concrete Thermal Casings, Inc.

240—Air Moving Equipment

Twelve page catalog contains complete information on Wausau air mover for various applications. The catalog is illustrated with features of construction, especially describing low silhouette and its modern design. It also contains dimension data, specifications, and electrical characteristics.
Greenheck Fan & Ventilator Corp.

241—Ventalog cfm Calculator

The *Ventalog* is a working tool to aid engineers in calculating the proper cfm requirement for any room area. In seconds, the *Ventalog* finds the cubic area of a room. Using the suggested rate of air change chart, the cfm is quickly calculated. An excellent companion piece for the Penn catalog.
Penn Ventilator Co. Inc.



242—Air Handling Equipment

Bulletin B-5216 is a selection guide for Westinghouse's complete line of air handling equipment. Covers heating, ventilating, mechanical draft, cooling, dehumidifying, and electronic air cleaning. Each product is illustrated, some with cutaways, and gives short description together with catalog number.
Westinghouse Electric Corp.

HIGHWAY, BRIDGE & STREET MATERIALS

243—Roadway Lighting

Bulletin 60-158 gives full information, including dimensions on the new OV-50 *Silverliner* 700 and 1000 watt mercury luminaire. These streamlined units are designed for wider roadways and heavy traffic areas. With remote or built-in ballast OV-50 luminaires are suitable for downtown areas, highway interchanges.
Westinghouse Electric Corp.

244—Concrete Paving Mixtures

Bulletin HB 27, issued by the Paving Bureau of the Portland Cement Association, gives methods of determining the quantities of fine aggregate, coarse aggregate, cement, and water which will give necessary workability and required finished properties. Charts, graphs, tables, formulas, examples included.
Portland Cement Association.

HIGHWAY, BRIDGE & STREET MATERIALS *continued*

245—All-Aluminum Davit Standards

Bulletin ALS-40 describes Pfaff & Kendall's all-aluminum davit standards. While slim and graceful, these lighting standards are engineered to perform in a rugged, functional manner. Each type of standard is described and complete specifications are given. Includes information on how to order.

Pfaff & Kendall.

247—Road Test Results

Bulletin "17 Million Miles to Better Highways", issued by the Portland Cement Association, describes official national road tests of concrete and asphalt paving. Tests were made to establish basic facts of design performance for both and to establish the applications to which each was best suited.

Portland Cement Association.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

248—Safe, Slip-Proof Surfaces

Bulletin describes the use of fused aluminum oxide and silicon carbide in the preparation of anti-slip surfaces on concrete floors, steps, sidewalks, concourses, and bridges. Methods of application. Can also be used with epoxy resins to cover existing surfaces. Samples in plastic containers included.

Exolon Co.

246—Suspension Bridge Data

Catalog D-943 contains technical data making possible preliminary calculations for comparative estimates between the suspension bridge and any other contemplated type. Includes formulas for determining cable and suspender lengths, cable tensions, erection calculations, and catenary formulas.

John A. Roebling's Sons Division.

249—Tapered Octagon Light Poles

Catalog 0-1860 describes continuous tapered steel and aluminum lighting standards for streets, highways, bridges, and area lighting. Contains 44 pages of drawings and complete specifications. Includes shaft covers, bases, overhead wiring, modifications, and accessories. Models pictured.

Kerrigan Iron Works Co.

INDUSTRIAL PROCESSING EQUIPMENT

250—Ball-Type Flexible Struts

Catalog 229A describes Barco's ball type flexible struts for refineries, power plants, chemical plants, paper mills, steel plants, and steam and processing piping. Cutaway photographs show construction and diagrams show dimensions. Included are engineering applications, advantages, capacities, and general specifications.

Barco Manufacturing Co.

252—Dryers, Heaters, and Coolers

Catalog 16-E, just published, completely describes Ruggles-Coles dryers, heaters, and coolers for industrial processing. Deals with fundamentals of drying and the selection of proper drying equipment. Completely illustrated with photographs and sketches. Details of construction shown in cutaways. Installations.

Hardinge Co., Inc.

251—Air Conditioning and Drying

Bulletin K-160 describes the latest model (Model C) *Kathabar* Air Conditioning and Drying Systems. The equipment is used to stop condensation; speed drying and other processing operations; obtain sub-freezing dew-points; make air sterile to hospital standards. Multicolor diagram shows operation. Fully illustrated.

Surface Combustion.

253—Steel Welding Fittings

Catalog H-2 provides information about the complete "Husky" line of carbon steel welding fittings for schedule 40 piping. Technical data is included for straight and reducing tees, concentric and eccentric reducers, 45° elbows, 90° elbows. Practical advantages of "Husky" fittings and performance tables.

NIBCO Inc.

INDUSTRIAL PROCESSING EQUIPMENT *continued*

254—Flexible Ball Joints

Bulletin 31A contains layout diagrams, photographs, and data on how to solve problems of thermal expansion and contraction in piping economically with flexible ball joints. Applicable to piping runs of any length and of any diameter from ¼ inch to 12 inches, including high temperature steel piping.

Barco Manufacturing Co.

255—Industrial Processing Equipment

Bulletin K-156 explains low-humidity principle of high-speed, continuous dryer for products which can be damaged by temperatures above 120°F. Contains description of process, case history, flow diagram. Describes pilot testing services. Sales engineering offices throughout the country are listed.

Surface Combustion

256—Stainless Steel Needle Valves

Bulletin NV-3 describes new line of Marsh needle throttling valves made of 316 stainless steel. Line opens up wider range of corrosion-resistant application. Valves are designed to give accurate throttling and positive shut-off at any pressure through 600 psi, any temperature from -100° F to plus 500° F.

Marsh Instrument Co.

257—Knittel Crusher

Bulletin 858 describes Knittel crusher with ring type double rotor. The literature features comprehensive technical and engineering data, specifications, diagrams, and illustrations. The unit offers an exclusive crushing action that increases capacity, crushes wet sticky material without danger of plugging.

Stephens-Adamson Mfg. Co.

258—Quick-Opening Doors

Bulletin QO-61 describes sure-lock 3/30, quick-opening doors for production pressure vessels. Illustrates 16 models as applied to vulcanizers, sterilizers, autoclaves, and similar equipment. Photographs illustrate typical applications. Construction and operation diagrams.

Biggs-United Division
United Sheet Metal Co., Inc.

259—Vibration Mounts

Bulletin describes, illustrates, and diagrams Rexon Mount Vibration Isolators employing principle of rubber-in-shear to control vibration and sound of working machinery. Engineering details, performance data, and computation tables enable *anyone* to properly order and install these Mounts.

Hamilton Kent Manufacturing Co.

260—Automatic Backwash Sand Filters

Bulletin 46-A describes Hardinge's automatic backwash rapid sand filters. Typical applications are industrial and municipal water supply, sewage, and industrial waste treatment. Cutaway shows construction and operation. Line drawings give details of installation. Photographs show actual installations.

Hardinge Co., Inc.

261—Yoloy Steel Plate and Sheet

Bulletin SPA-014A-560 describes Yoloy E steel plate and sheet. Features corrosion resistance, high strength, and weight reduction. Explains why alloyed steels are better, that intricate shapes can be readily cold formed from ductile Yoloy E steel. Applications pictured. Mechanical properties given.

Youngstown Sheet and Tube Co.

262—Direct-Fired Combustion Chamber

Package design *Todd-Thermo* high heat release combustion chamber for direct firing of oil, gas, or combination oil/gas, is described in bulletin TD58-43X. Standard unit or custom built with capacities from 150,000 to 200,000,000 Btu/hr, air-cooled. Needs no refractory, gives trouble-free performance.

Todd Shipyards Corp., Products Div.

263—Mixers

Bulletin MX-105 contains general specifications for eight standard models of Hetherington & Berner mixers for bituminous batch plants. Mixers are available unjacketed or they can be jacketed for mixing any semi-dry material that requires maintenance of uniform temperature throughout mixing cycle.

Hetherington & Berner Inc.

264—Process Heating Technical Data

Bulletin 356, 24 pages of process heating technical data. Describes types, shapes, dimensions, heating surface, fittings, applications and installations of Panelcoil. Graphs, tables, methods of calculating heat transfer requirements and complementary physical and thermal data, arranged for easy reference.

Dean Products, Inc.

265—Wet Scrubber

Bulletin 3-ATC-9 describes new scrubbing technique that features a dense bed of liquid in finely divided state, created by internal recirculation and maintained automatically without use of pumps or nozzles. Cutaway view of vertical diffuser shows the unique Aeromix operating principle and flow.

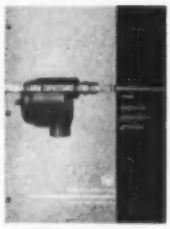
Aerotec Industries, Inc.

INSTRUMENTS, CONTROLS and GAUGES

266—Boiler Water Level Controls

Catalog section 3 describes complete line of standard and special water column, control, and low water cut-offs for low, medium, and high pressure steam or hot water boilers. Units classified by function and type of service for easy reference. Theory and operation of these unique controls explained.

Magnetrol, Inc.



267—Capacitance Level Controls

Bulletin describes *Prob-A-Larms*, a practical, low cost method of detecting and controlling quantities and levels of liquids, powders, and grains. High level alarm, low level alarm as well as high and low cycling for pumps or drains are common applications. Well illustrated.

Weighing & Controls, Inc.
Subsidiary of CompuDyne Corp.

268—Automatic Solenoid Valves

Bulletin 2111-7 describes *Electroflo*, the automatic solenoid valve for use under critical and difficult operating conditions, totally waterproof and guaranteed forever. Bulletin contains features, how to order data for various conditions. Also includes dimensional diagrams, flow capacity chart, and electrical data.

Hays Manufacturing Co.

269—Liquid Waste Flow Meter

Bulletin 28 describes the Stevens Model 60M total flow meter. A completely new instrument designed to meet the need for low-cost yet is accurate and dependable. Instrument for measuring the flow of sewage, industrial wastes, or other liquids in open channels. Portability and versatility are featured.

Leupold & Stevens Instruments, Inc.

270—Buried Pipeline Detector

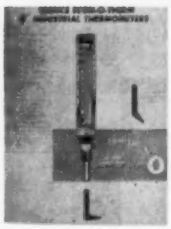
Bulletin PD describes Tinker and Rasor's transistorized Pearson-type Holiday detector for locating electrical contacts on pipelines, open couplings and discontinuities in coating, without uncovering the pipeline. Bulletin furnishes specifications, operating data and components. Photographs show use.

Tinker and Rasor.

271—Air Filter Gages

Bulletin C-1 presents the standard Dwyer line of filter gages. The consulting engineer's specification data is included for each of the three standard types of gages. These gages prvoide a continuous check on the efficiency of all types of filters. Various types are illustrated. Sales representatives are listed.

F. W. Dwyer Mfg. Co.



272—Low Cost Thermometers

Bulletin 3100M describes a complete new line of thermometers, both mercury and dial indicating. Each thermometer offered is illustrated. Specifications and prices are charted. Panel drilling dimensions, standard ranges, and complete ordering information included. Sales offices in Canada and United States listed.

H. O. Trerice Co.

273—Small Circular Chart Recorders

Bulletin 3057 describes Edison's *Omnicorder*, the inkless, circular chart recorder smaller than an ordinary panel meter. Outlines features, operation, construction, specifications, dimensions, and lists accessories. Text is illustrated with photographs and line drawings. Ordering information included.

Thomas A. Edison Industries.

274—Plunger-Type Mercury Relay

Bulletin 0-20 describes a new design in plunger relays particularly suitable for heavy duty loads such as resistance heating, heat treating furnaces, drying ovens, drying equipment, and welding. Also used for illuminated signs and score boards. Includes features, application, operation and electrical ratings.

Mercoid Corp.

275—Fuel Cut-Out Control

Bulletin D2.5 describes a new device providing single or dual fuel cut-out control and low water level alarm if desired, is the *Levalarm* EA-100P. Cut-out can be controlled by a float-operated function or by an electrode set-up, or both may be used where dual cut-out facilities are prescribed.

Reliance Gauge Column Co.

276—Annunciator with Recorder

Bulletin 102A describes Panalarm's Model RA standard annunciator system with a highly accurate built-in automatic recorder. Gives a dependable, precise record of your equipment's operations. Advantages including exclusive features, and specifications. Photographs show installation, components, and operation.

Panalarm, Division of Panellit, Inc.

277—Valve List and Selection Guide

Bulletin 506 new stock and selection guide lists the world's largest stock of solenoid valves for immediate delivery. Easy to select valve suited for your application. Valves are grouped under specific types — 2-way normally closed, 2-way normally open; 3-way; 4-way; manual reset and special purpose.

Automatic Switch Co.

INSTRUMENTS, CONTROLS & GAUGES *continued*

278—Temperature, Pressure Controls

Catalog for engineers who specify temperature, pressure, and control instruments. Detailed specifications on industry's most complete line of thermometers, gauges, controllers, control valves, pressure regulators, air filters, air guns, steam traps, and others. Data is complete and accompanied by illustrations.
H. O. Trerice Co.

279—Constant Feed Weigh Systems

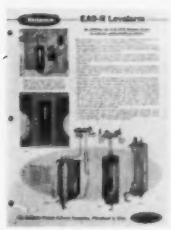
Catalog 14 covers systems for continuously maintaining uniform flow rates of solids or liquids used in processing and formulating bulk materials. Details the use of unitized components to reduce development costs of job-engineered systems. Section on control instrumentation and photographs.
Weighing & Controls, Inc.

280—Interlocking Flow Switch

Bulletin 2600 describes *Shur-Flo* an electrical interlocking protective flow switch. Built with all non-corrosive parts, *Shur-Flo* is designed to provide automatic protection whenever rate of fluid flow is below or above a safe and critical rating. Wiring diagrams and ordering data.
Hays Manufacturing Co.

281—Meteorological Instruments

Bulletin 19 describes Stevens precipitation recorders and other weather instruments are described in the weighing type, float actuated, and tilting bucket type recorders are illustrated and described. Six pages include applications data, instrument specifications, and information on new Stevens Rain Recorder.
Leupold & Stevens Instruments, Inc.



282—Reading Liquid Level Indicator

Catalog Sec. C6.1D describes EA9-R *Levalarm,* and addition for *Eye-Hye* remote gages to actuate supplementary alarms. Contains exterior and interior views, and photographs of light indicators, horns, and various types of relays. Wiring diagrams for light indicator or horn. Shows indicator and horn hook-up.
Reliance Gauge Column Co.

283—Annunciator Systems

Catalog 100C describes annunciator systems manufactured by Panalarm. The function, benefits, and selection of Panalarm annunciator systems are discussed. Included in this 50 page catalog are dimensions, plug-in relays, remote equipment and components, accessories, engineering data, and ordering information.
Panalarm, Division of Panellit, Inc.

284—External Chamber Level Controls

Catalog Section 6 illustrates a broad line of liquid level instruments used for control, alarm or shut down. Both float and displacer types are described for operation with liquid pressure up to 5000 psi. Special features for corrosion and vibration service or interface applications are also included.
Magnetrol, Inc.

285—Indicating and Alarm Systems

Bulletin 3036C describes Edison's *Omniguard,* the modern economical way to monitor temperatures and pressures. Features, operation, specifications, connections, wiring diagrams, and installation information included. Complete data on temperature and pressure monitoring. Photographs, charts, and diagrams.
Thomas A. Edison Industries.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

286—Motorized and Magnetic Valves

Catalog V-61 describes Mercoid's magnetic and motorized valves for air, water, oil, gas, steam, and other industrial applications. Each type is illustrated, and specific application is given. Specification data includes type, service, pressure, body, seat, dimensions, and electrical requirements.
Mercoid Corp.

287—Detector Specifying Guide

Specification Guide for electrical Holiday inspection in handy folder form contains information on types of detectors, inspection methods, and techniques. The guide includes other material to aid consulting engineers in obtaining adequate inspection of coating systems. Detectors are illustrated.
Tinker and Rasor.

288—Controls and Gages

The complete Gage and Control Catalog contains illustrations, prices and complete details on Dwyer *Magnehelic,* gages, manometers, air meters, air filter gages, pitot tubes, pressure actuated switches, flowmeters, combustion testing instruments. Diagrams, conversion curves, and other technical data.
F. W. Dwyer Mfg. Co.

INSTRUMENTS, CONTROLS & GAUGES *continued*

289—Solenoid Valve Catalog

Catalog 202 contains condensed listing of ASCO solenoid valves including 2-, 3-, and 4-way valves for standard duty or special applications, such as corrosion resistant, sanitary, bulk loading and steam. Features helpful chart to aid in selection of proper valves for handling various corrosive gases and liquids.

Automatic Switch Co.

295—Light-Sensitive Time Controls

Bulletin 78 describes switches to combine mechanical switching with light sensitivity, for automatic ON/OFF control of lighting. Offers all advantages and versatility of photo cell and time switch control but providing much flexibility over either straight time or photo electric control.

Tork Time Controls, Inc.

290—Accurate Boiler Water Levels

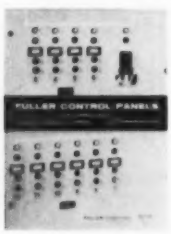
Reprint of paper presented by the Power Division of ASME discusses the problem of obtaining accurate drum-level indications in high-pressure steam generators. Covers ways of compensating for density changes and appreciable sudden drops in pressure such as associated with nuclear propulsion.

Yarnall-Waring Co.

296—Dust Level Alarm

Illustrated folder details an improved device for signaling whenever fly ash or other finely divided dry material reaches at predetermined level. Self-contained actuating unit operated by pressure differential uses no moving parts in hopper, eliminating danger of attack from abrasive dusts or high temperatures.

Aerotec Industries, Inc.



291—Control Panels

Bulletin G-9 describes modern graphic panels for automatic handling of dry materials and process equipment control. Panels are designed and fabricated by manufacturer and are internally wired. Wiring diagram is furnished and supervision is normally furnished for start-up of system. Illustrated.

Fuller Co.

297—Manometer for Plant and Lab

Catalog 2008 covers U-type, single- and multi-tube well-type, and inclined-tube *Manometers*, for measuring pressure vacuum, flow; draft gauges; indicating liquids; accessories. Explains operating principle and inherent accuracy. Discusses points to consider in selecting *Manometers* for specific applications.

King Engineering Corp.

292—Electrical Operator

Bulletin B-7534 describes Westinghouse's electrical operator for remote control of types E, EH, F, and HF circuit breakers. Electric operator is same size and occupies the same amount of space as the breaker. Illustration with keyed dimensions. Schematic diagram shows circuit and operation. Applications.

Westinghouse Electric Corp.

298—Fire Alarm Systems

Catalog F249 comprises several bulletins in a binder completely describing *Flexalarm*, Gamewell's fire alarm systems. Bulletin F249A describes and illustrates the systems components; F249C gives complete specifications and circuit diagrams; 131 and 132 detail local fire alarm control cabinets. Special systems.

Gamewell Co.

293—Annunciator Nameplates

Bulletin sheet describes new *Magna-Plac* nameplate now available as a no-charge option on Scam *De-Line* annunciators. New, larger nameplate provides 70% more engraving area; 50% more characters per nameplate, without increasing overall size of annunciator. For fully descriptive, visible trouble legends.

Scam Instrument Corp.

299—Ground Detectors

New ground detector for hospital isolated voltage systems is featured in Engineering Data Sheet 14R-0001. Green light indicates normal safe conditions. Red light and buzzer warn when ground occurs. Detects up to 60,000 ohms leakage to ground. Will not allow over 2 milliamperes to pass through system.

Zenith Electric Co.

294—Water Flow Instruments

Miniature Strip Chart Instrument for complete and accurate indication, totalization and recording of fluid flows. Provides same functions as larger instruments; requires less panel space. Bulletin 330 shows working mechanism, chart capacities, installation specifications.

Sparling Equipment
Hersey-Sparling Meter Co.

300—Automatic Temperature Controls

Condensed Catalog 27 describes and illustrates the 1961 line of Barber-Colman temperature and humidity controls. Valve selection data is included for easy reference. Featured is an entire new line of room thermostats in single and duplex models for electrical ratings up to 1/3 hp.

Barber-Colman Co.

INSTRUMENTS, CONTROLS & GAUGES *continued*

301—Instrumentation Capability

Booklet 800 shows examples of Liquidometer's experience in the design, development and production of electronic and electromechanical instruments and controls for a wide range of industrial applications. Included are tanks contents, gauges, and liquid level controls which measure virtually any liquid.

Liquidometer Corp.

302—Clock and Program Systems

Covers clock and program systems — two types include synchronous motor-powered secondary clocks, the other combining secondary clocks, minute-impulse type. Both have simplified programming, automatic resetting of secondary clocks. Bell control boards, various type signals, and clocks included.

Standard Electric Time Co.

303—Complete Line of Gauges

Catalog 76-G illustrates and describes the comprehensive line of Marsh gauges. Covers case patterns and dimensions. Illustrates choice of easy reading dials and shows many recent improvements in pressure gauge design. Also includes solenoid valves and needle valves often used in applications requiring gauges.

Marsh Instrument Co.

304—Rate Transducer

The Merrick Rate Transducer is specifically designed to translate the true rate measurement (rpm) of the Integrator into an electric rate output. This accessory keeps your Weightometer at peak efficiency under all conditions. Various applications are detailed and diagramed. Integrators are described and pictured.

Merrick Scale Mfg. Co.

INSULATION & PROTECTIVE COATINGS

305—Sprayed *Limpet* Asbestos

Bulletin describes a spray-shaped 100% asbestos thermal insulation for industrial use. Faithfully follows contours of any surface. Easy spray-gun application without mechanical supports. Also offers fire protection, noise reduction, dust exclusion, condensation control, and corrosion prevention.

Keasbey & Mattison Co.

306—Gilsulate Applications

Illustrated booklet S-88 gives the complete story of *Gilsulate;* what it is, what it does, how it's used, and who uses it. Booklet explains installation procedures and insulating values. Also tells of the organization in back of *Gilsulate* — checking of piping layouts and soil conditions and supervision of installations.

American Gilsonite Co.

307—Pipe and Block Insulation

Bulletin describes new Urethane foam insulation for temp. —300°F to +220°F. Advantages of Unarco U-200 are outlined. Bulletin includes physical properties and general product specifications. Chemical reaction test results given. Actual job photographs. Other Unarco products described and pictured.

Union Asbestos & Rubber Co.

308—Pipe Protection Tape

Bulletin introduces Tapecoat 20, an improved, hot-applied, pliable coal-tar coating in tape form, gauged for thickness. Includes polyester film outer wrapper. Designed for single-thickness application with minimum overlap. Easy to apply on pipe, joints and fittings, conduit, cable, insulated pipe, tie rods.

Tapecoat Co.

309—Hot Surface Paint Problems

"If it operates at 300°F or above, use silicone paint." Bulletin R-7-212 reports the savings now enjoyed by a large oil company following this policy. Histories of reduced maintenance and how-to tips on silicone-based paint protection are described for process equipment operating continuously from 400°F to 850°F.

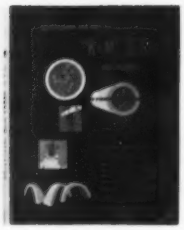
Dow Corning Corp.

310—Protective Coatings

Bulletin 7-2 describes Atlas' complete line of protective coatings, for corrosive fumes, corrosive splash, or abrasion. Preparation of concrete, metal, and wood surfaces explained. Details the *Ampvar* wash primer system where sandblasting is not possible. Actual applications are photographically illustrated.

Atlas Mineral Products Co.

INSULATION & PROTECTIVE COATINGS *continued*



311—*Zebra* Pipe Insulation

Bulletin describes "K&M" *Zebra* pipe insulation for low, medium, and high temperatures, 200°F to 1200°F. This multi-layered sectional type thermal insulation withstands intense vibration, will not warp or crack under operating conditions. Easy to cut and fabricate. Reduces breakage in transit.

Keasbey & Mattison Co.

312—Coal-Tar Protective Tape

Hot coal tar protection in easy-to-apply tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly to soften the pitch, then spirally wrapped onto pipe surface. Tapecoat provides long-life protection equivalent to a hot-applied coal-tar pipeline coating.

Tapecoat Co.

313—Pipe Insulation News

News magazine, published by the manufacturer of Gilsulate insulation for underground hot pipes, carries stories and articles on actual installations. This issue describes use of Gilsulate by Caterpillar Tractor Co., gives a report on Gilsulate efficiency, and instructions for tamping the Gilsulate bed. Illustrated.

American Gilsonite Co.

314—Guide to Comfort Insulation

Catalogue 157-117-61 covers specifications and installation methods for three Dow foamed plastics used in comfort installation. Foundations and floors, walls and roofs are covered in detail. Includes illustrations, engineering data and advantages and limitations. Photographs and line drawings.

Dow Chemical Co.

LIGHTING FIXTURES & ACCESSORIES

315—Bonus Line Fluorescent Ballasts

GEA-6912 describes new *Bonus Line* fluorescent ballasts for indoor commercial and industrial applications. New capacitor and special thermal protector are new ballast developments by General Electric. Bulletin gives full information on *Bonus Line* protection features, plus ratings, electrical data, dimensions.

General Electric Co.

316—Fluorescent Lighting

Handsome Corona, framed in rich solid walnut, and Coronet, finished in bone white with luxurious gold anodized louvers and gently rounded form, are new from Lightolier. They supply elegant, versatile solutions to a great variety of fluorescent lighting requirements for residential and commercial locations.

Lightolier Inc.

317—Quartzlite Floodlights

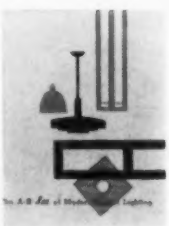
Bulletin QL-15-161 describes complete new line of Appleton *Intenso* "*Quartzlite* 1500" watt floodlights. Consist of three different beam spread models, each available in two different mountings. Features, applications, and accessories included. Components shown in photographs. Photometric data. Price list.

Appleton Electric Co.

318—Flood Lighting Equipment

User Net Price List 61-320, describes the full line of Westinghouse flood lighting equipment. The bulletin is illustrated with a photograph of each unit, provides a general description of the unit, construction and lamp details, ordering information, shipping weights, and suggested net user prices. Accessories listed.

Westinghouse Electric Corp.



319—Modern School Lighting

Booklet "The A-B-See of Modern School Lighting," written by a research engineer, is factual and authoritative. Various problems of classroom lighting, glare, reflection, daylight, artificial light are discussed. Types of fixtures are pictured with comparison charts and conclusions. Free to the consulting engineer.

Smoot-Holman Co.

320—Multi-Vent Troffer

Sylva-Flo brochure gives complete story on combination light and air troffers using patended *Multi-Vent* principle. Superior air-conditioning, higher light efficiency, truer lamp color, longer ballast life are a few of the benefits. Includes technical data, both air handling and photometric, plus specification details.

Sylvania Electric Products Inc.

LIGHTING FIXTURES & ACCESSORIES *continued*

321—Commercial Industrial Lighting

User Net Price List 61-020, describes the full line of Westinghouse commercial and industrial lighting fixtures. The bulletin is illustrated with a photograph of each unit, provides a general description of the unit, construction and lamp details, ordering information, shipping weights, and suggested net user prices.
Westinghouse Electric Corp.

322—Multi-Mount Exit Lights

Bulletin 98 describes new highly styled, Guth *Multi-Mount* Exit Lights. Combinations of 3 lighting sources and 5 mounting methods provide complete versatility of installation. Dimensions given and combinations listed. Beveled *"easy see"* face and handsome new profile give near perfect directional lighting.
Edwin F. Guth Co.

323—Fluorescent Ballast for Signs

A catalog of Universal fluorescent lamp ballasts for sign, flashing, and weatherproof use has been published. Data includes all electrical and physical characteristics, wiring diagrams, mounting instructions, and a cross reference guide. Pertinent UL regulations and suggestions for proper performance.
Universal Manufacturing Corp.

324—Compact Exit Signs

Folio 60-2 introduces the newest, most compact, code regulated illuminated directionals. "50 line" EXITS by mcPhilben are all cast aluminum, glass or stencil face, incandescent or fluorescent. Wall, ceiling extending bracket, recessed or pendant series available. Contains specifications and engineering data.
mcPhilben Lighting Inc.

325—Indoor Luminaire Maintenance

Safe low-cost floor-level servicing of high-bay luminaires is described and illustrated in Bulletin TH-57. The five basic requirements for a Thompson hanger installation, available hanger models, accessories, Underwriters' ratings, and range of applications also are outlined in detail. Illustrated.
Thompson Electric Co.

326—Industrial Fluorescent Lighting

Bulletin F describes the newly designed and expanded line of industrial fluorescent lighting fixtures offered by the Benjamin Division of Thomas Industries Inc. Catalog includes detailed illustrations and complete specifications covering all elements of the line. The many features of this new line are explained.
Thomas Industries Inc., Benjamin Div.

327—Fluorescent Lamp Ballast Guide

Bulletin ATC-111 is a new fluorescent lamp ballast buyer's guide, listing the newest models. Included is electrical data, physical dimensions, and packaging of popular 60 cycle ballasts. All information is in tabular form for easy reference. Also includes conditions of sale and other pertinent information.
Advance Transformer Co.

328—Combination Fixtures

Bulletin describes the *Ventro-Lux* fixture manufactured by Curtis-AllBrite. Provides light, heat, cooling, and ventilation in the one troffer. It cools, heats, and ventilates more quickly, more effectively, and more completely. Cutaway shows construction and operating principle. Specifications and dimensional data.
Curtis-AllBrite Lighting Inc.

329—Mercury Lamp Ballast Guide

Bulletin GEA-7056 provides specifiers information on how to select and apply mercury lamp ballasts. Gives data on five construction types. Includes effects of operating conditions, dimensions, electrical data, line current characteristics, outline drawings, and wiring diagrams. Features of this ballast illustrated.
General Electric Co.

330—Fluorescent Lighting Fixtures

Bulletin OD-1051 Day-Brite's Fairview fluorescent lighting fixture that combines beauty with efficient lighting. Delivers today's footcandle levels while retaining the trim, sleek look. Fixtures are illustrated and line drawings show cross-section. Fairview application suggestions given and illustrated.
Day-Brite Lighting, Inc.

331—Hinged and Framed Troffers

Specification Sheet 30 describes the hinged and framed troffer manufactured by the Wakefield Company. Photograph illustrates actual troffer and line drawing gives specific dimensions. ETL photometric report included. Line drawings show units to fit various ceiling constructions. Gives specifying points.
Wakefield Co.

332—Outdoor Lighting Developments

Catalog L-3 describes important developments in Pfaff & Kendall's outdoor lighting equipment. Gives attractive, functional light for the shopping center, service station, airport, restaurant, recreation area, and street. Many applications are pictured. Various types of standards and luminaires illustrated.
Pfaff & Kendall.

LIGHTING FIXTURES & ACCESSORIES *continued*

333—Improved Lighting Systems

Catalog Section D-C describes new patented perfect vision luminaires for Power Groove, SHO or VHO 1500 MA lamps. System features new principles of brightness and glare control which, when combined with illuminating efficiency of 1500 MA lamps, are said to heighten light levels and seeing comfort.
Smoot-Holman Co.

334—Floodlights

Bulletin EF-760 describes a new series of 5 Appleton *Intenso* floodlights, a part of the new *Intenso* family recently announced. Brochure listing a total of 9 different models open and enclosed and 5 NEMA types. Lighting curves, accessories, and technical specifications are all a part of this bulletin.
Appleton Electric Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

335—Louver Diffusers

Folder 6 describes the *Mystic Gratelite* louver diffuser. When installed in fixtures or overall ceilings, *Mystic Gratelite* changes from an open louver diffuser to a solid-appearing luminous panel — depending on your point of view. Folder shows complete line of Guth fluorescent fixtures and *Gratelite* overall ceilings.
Edwin F. Guth Co.

336—Cross Reference Guide

Bulletin CR-61 is a revised Cross Reference Guide has been published showing Universal *Service Guaranteed* ballast catalog number equivalents for fluorescent lamp ballasts of other manufacture. It also contains a ballast rating table and information regarding mounting dimensions, ETL certification, code dating.
Universal Manufacturing Corp.

337—Special Purpose Lighting Units

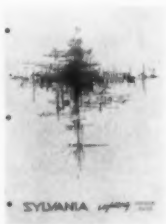
Folio 61-1, a 12 page booklet, describes mcPhilben's unique line of cast aluminum special purpose lighting units. Applications for vaportight, exterior, general interior use and directional signs. Includes specifications, drawings, and optional features to assist you in selection of quality lighting.
mcPhilben Lighting, Inc.

338—Efficient Fluorescent Lamps

Bulletin A-7263 describes Westinghouse high efficiency fluorescent lamps. Contains features, technical data, and comparative output chart. Typical applications for these lamps are listed and pictured. Advanced engineering achievements as plated leads, silicone coating, triple coiled electrodes are shown.
Westinghouse Electric Corp.

339—New Fluorescent Fixtures

Opticon, a new concept in fluorescent lighting by Lightolier, features an injection molded lens for precise light control and maximum rigidity. In continuous runs, it presents a fine, finished appearance with no dark joiner strips. Here is quality lighting at modest cost for school, office, and institution.
Lightolier Inc.



340—Lighting Design Data

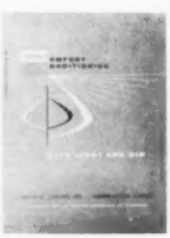
Concise yet thorough coverage of lighting terms, formulae and design factors makes Bulletin VE-900 an ideal reference book and design guide. Area lighting systems are covered for both panel and louver type ceilings. On the back page is a listing of current recommended illumination levels for many applications.
Sylvania Electric Products Inc.

341—Industrial Luminaires

Bulletin describes CA88 Alzak industrial luminaires by Curtis-AllBrite. This new and improved fluorescent lighting fixture provides more glare-free light in industrial plants. The use of Alzak aluminum reflectors assure maximum light. Contains illustrations, specifications, and dimensional data.
Curtis-AllBrite Lighting Inc.

342—Fluorescent Lamp Ballasts

GEC-983 gives full information, including prices and electrical data, for a complete line of fluorescent ballasts. Covered are rapid-start, instant-start, pre-heat-start, dimming, outdoor, plastic sign, and weather-proof ballasts. Data on new *Bonus Line* ballasts. Wiring diagrams, dimensions, and installation data.
General Electric Co.



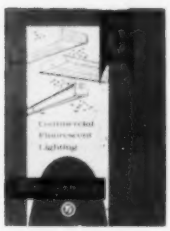
343—Light and Air Diffusers

Catalog OD-1040 describes light and air diffusers in one unit. Line drawings show construction and operation of various types. Includes selection of illumination levels, installation planning, and fundamentals of fixture selection. Fixtures illustrated with specifications. Air distribution and lighting performance data.
Day-Brite Lighting, Inc.

LIGHTING FIXTURES & ACCESSORIES *continued*

344—Injection-Molded Luminaire

Spec-Data sheet fully describes this new refracting luminaire, in four and eight foot lengths. The Photometric unit was developed for those who want the finest in engineered lighting. Contains limitations, specifying points for engineers, Photometric report, and accessories. Construction drawings and dimensions.
Wakefield Co.



345—Commercial Fluorescent Lighting

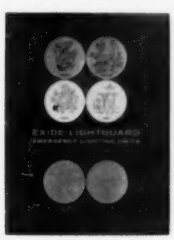
This new Commercial Fluorescent lighting catalog, Bulletin C, describes special lighting unit for commercial establishments. The high lighting standards of modern classrooms, offices, stores, and other installations are met with these units. Diagrams of the various fixtures and tables of lighting statistics are shown.
Benjamin Div., Thomas Industries Inc.

346—Lighting Design Values

Technical bulletin 110 supplies lighting design values for two-stage lighting as obtained with a Slater *Hi-Lo* dimmer switch. Tables have been compiled to assist the architectural lighting designer in planning illumination requirements to meet new I.E.S. standards. Wiring diagrams included.
Slater Electric & Mfg. Co., Inc.

347—Quartz-Beam Floodlights

Bulletin 2725 introduces a compact, highly efficient floodlight designed for the quartz-iodine lamp. Buildings, signs, golf driving ranges, and many other uses are possible applications for the new floodlight, which takes advantage of the long lamp life and high efficiency of the quartz-iodine lamp.
Crouse-Hinds Co.



348—Emergency Lighting Units

Completely automatic, self-contained Exide *Lightguard* units give protection against hazards of sudden darkness. Bulletin 6456 describes full line of battery-powered units, from economy model through new high-capacity unit — for stores, restaurants, theatres, factories, offices, schools, institutions.
Exide Industrial Division.

349—Lighting Duct

Bulletin ULD-660 describes BullDog's *Universal* lighting duct. Presents pictorially the components of this flexible lighting system which suspends and electrically energizes lighting fixtures and small power tools. Lists various types of duct, suspension equipment, and fittings.
BullDog Electric Products Division
I-T-E Circuit Breaker Co.

350—Outdoor Luminaire Maintenance

Safety and cost-saving features, typical installations, operating procedures, and available models of Thompson *Servisafe* pole and bracket units are covered in Bulletin PWB-59. *Servisafe* products permit fast hazard-free ground-level luminaire servicing by one man to assure year-round lighting efficiency.
Thompson Electric Co.

351—Interior Lighting Design

Booklet A-7235 is a 60-page, pocket-size manual on footcandle levels and interior lighting design. Contains valuable information including tables which apply to modern luminaires and light sources. Easy to use tables show luminaire, distribution, spacing, coefficients of utilization, and maintenance, factors.
Westinghouse Electric Corp.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

352—Weather-Proof Fixtures

Bulletin E-360 describes vapor-tight, weather-proof fixtures and fittings made by the Adalet Manufacturing Company. Exploded view shows assembly sequence of components. Each type of fixture is illustrated with specifications in tabular form. Includes complete information on accessories. Decorative fixtures shown.
Adalet Manufacturing Co.

353—Emergency Lighting

Booklet entitled "The Odds on Emergency Lighting" is offered by the Electric Cord Co. Useful features of *Light Warden*, cost, and how it works described. Floor plans demonstrate the way *Light Warden Chargomatic* is installed and typical installation costs given. Photograph shows components.
Electric Cord Co.

354—Vapor-Proof Fixtures

Catalog lists Killark's line of vapor-proof light fixture assemblies, junction boxes, and receptacles. Cross-referenced to show many variations in mounting methods, wattage, globes, and reflectors. Complete dimensional data. Killark fixtures are made only from aluminum castings to provide longer life and greater safety.
Killark Electric Manufacturing Co.

LIGHTING FIXTURES & ACCESSORIES *continued*

355—Automatic Time Controls

Catalog 71 shows how to select proper switch action and timing dial for automatic control of electrical circuits. Line drawings, wiring diagrams. Dimensions, and specifications on ON/OFF time controls. Features *Astronomic* (on at sunset, off as selected) and *Reverse* (operates despite power failure).

Tork Time Controls, Inc.

356—Fluorescent Lamp Ballasts

Bulletin 1204 contains complete information on fluorescent lamp ballasts. Discussed are various fluorescent circuits illustrated with diagrams. Installation and operation data included on voltage supply, interference, ventilation, and cold weather operation. Includes information on testing and measuring current.

Advance Transformer Co.

MATERIALS HANDLING & STORAGE FACILITIES

357—Moving Sidewalks and Ramps

Bulletin 1060 describes *Speedwalk* and *Speedramp* passenger conveyor systems from Stephens-Adamson. The literature presents comprehensive technical data, engineering specifications, drawings and illustrations of moving sidewalks. Installation photographs and an exploded view of a Speedramp are featured.

Stephens-Adamson Mfg. Co.

361—Power and Free Conveyors

Bulletin 960 describes *Power-Flex* with *Telematic* automatic dispatch control, a power and free conveyor system. Applications include overhead gravity storage banks, manufacturing work stations, and others. Operating features of rail, chain, and trolleys shown in photographs. Typical conveyor system diagramed.

Columbus McKinnon Corp.

358—Portable Transfer Units

Bulletin A-20 describes new Fuller portable Airveyor® transfer units for handling grain, seeds and similar material. The mobility and versatility of this compact unit is fully covered in this bulletin in capacities up to 45 tph. Diagrams show typical applications. Includes detailed specifications.

Fuller Co.

362—Car Pullers

Ten-page bulletin L-6 shows capstan type car puller for moving cars a short distance using manila rope. Three styles of drum car pullers for heavy duty car moving, shuttle work, or for servicing very large areas are also listed, as well as barge movers for shifting barges back and forth during unloading.

Clyde Iron Works, Inc.

359—Industrial Water Storage Tanks

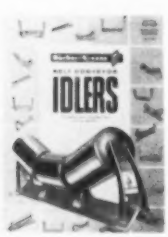
Graver's house magazine, the ECHO, offers interesting case histories of storage tanks for industries and municipalities, and of specialized process vessels in steel and alloys. Several new storage designs are described, and the issue is both readable and informative. Applications illustrated.

Graver Tank & Mfg. Co.

363—Vacuum Materials Handling

Bulletin V-100-R describes how Whiting Pressuregrip vacuum handling systems move heavy loads by using the physical pressure of the great sea of air which surrounds the earth. Cross section sketches show how grippers work. Basic components are pictured and described. Pressuregrip systems will fit every need.

Whiting Corp.



360—Belt Conveyor Idlers

Sales Manual, Page 3200, describes belt conveyor idlers manufactured by Barber-Greene. Complete line is illustrated; and advantages are given. Cutaways show construction. Selection tables and instructions. Line drawings accompanied by tables of weights and dimensions. Standardized conveyor components shown.

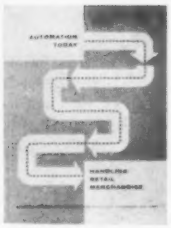
Barber-Greene Co.

364—Automatic Handling Systems

Catalog 67-A describes, illustrates (photographs and diagrams) engineered and automated handling systems. The 16-page "Plan with Planet" brochure also illustrates equipment for bulk and unit materials, automated and special handling machinery, and foundry equipment. Describes Planet's creative service.

Planet Corp.

MATERIAL HANDLING & STORAGE FACILITIES *continued*



365—Handling Retail Merchandise

Reprint of article from Automation magazine entitled "Handling Retail Merchandise". This is a case history of how a downtown St. Louis department store solved their merchandise handling problems through the use of Columbus McKinnon equipment. With text there is a schematic of system and photographs.
Columbus McKinnon Corp., Conveyor Div.

366—Curve Crown Pulleys

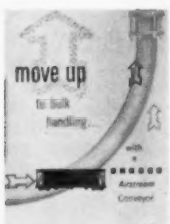
Bulletin 558 describes *Curve-Crown* welded, all-steel pulleys. The literature features comprehensive technical and engineering data, specifications, diagrams, and illustrations on the S-A *Curve-Crown* welded, all-steel pulley. This revolutionary design offers maximum belt training effect and minimum belt wear.
Stephens-Adamson Mfg. Co.

367—Water Storage

Graver offers a useful 2-page catalog sheet on the essential features of water storage tanks of every type. This information provided presents a quick summary of both new and basic forms and can be conveniently filed for ready reference. Diagram shows construction. Includes capacities and dimensions.
Graver Tank & Mfg. Co.

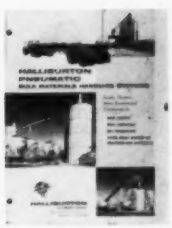
368—Overhead Materials Handling

Whiting's *Trambeam®* overhead materials handling systems, crane and monorail, are described in bulletin M-34. Four page spread pictures many applications, large and small, as well as special applications. Various components, which make up the system, are pictured and described. Advantages outlined.
Whiting Corp.



369—Pneumatic Conveying Systems

Bulletin 532 describes Dracco's airstream conveying systems. Versatile in performance and installation and profitable because of operational savings. Schematic chart shows flow of materials. Illustrated reports on plastics firms making large savings by bulk purchasing made possible through pneumatic conveying.
Dracco Division of Fuller Co.

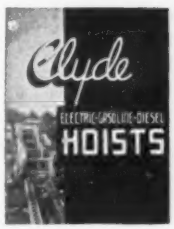


370—Pneumatic Materials Handling

Brochure SP-11001 describes and illustrates Halliburton pneumatic bulk materials handling systems for loading, conveying, transporting, and unloading powdered, granular, and most pelletized dry materials. Installations to date have handled products varying in density from 16 lbs to 168 lbs per cu ft.
Halliburton Co.

371—Materials Conditioning Conveying

Bulletin G-3D describes Fuller rotary compressors, vacuum pumps, coolers, pre-heaters, blowers, fans, exhausters, and pneumatic conveyor systems for handling dry, pulverized, granular, and crushed materials. Illustrated with photographs and operational line drawings. Capacity and rating tables.
Fuller Co.



372—Power Hoists

Bulletin 34A, 20 pages, describes the Clyde line of electric, gasoline, and diesel hoists. Gives construction details of medium capacity hoists of various line pulls. Also includes information as to selecting the hoist, information required for hoist quotation, and table of drum cable capacities.
Clyde Iron Works, Inc.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

373—Crane and Hoist Electrification

Bulletin 76 tells why steel-enclosed Feedrail 60/90, 100/150, 225, 375 and 500 ampere crane and hoist electrification systems are specified. Advantages in design, in safety, in erection, and in performance are outlined. Includes photographs of typical installations and equipment descriptions.
Feedrail Corp.

374—Elevator Systems

Catalog SW-1 describes the complete line of Haughton Elevators, with special detailed information given on Haughton "*Auto-Signamatic*" systems for complete automation of multiple-unit elevator groups. Includes recommended sizes and dimensions for passenger, freight, hospital elevators, and dumbwaiters.
Haughton Elevator Co.

375—Revolver Cranes

Catalog 400-R-4 describes American revolver cranes for handling heavy materials. Capacity of 400 tons; adaptable to gantry, fixed, or barge mounting; for use with hook, bucket, magnet, or pile hammer. Contains many illustrations of American revolver cranes at work in varied situations. Typical assemblies shown.
American Hoist & Derrick Co.

MATERIAL HANDLING & STORAGE FACILITIES continued

376—Overhead Traveling Cranes

Bulletin 5000B covers Conco custom-engineered overhead electric traveling cranes, of double girder construction. Can be furnished in a wide range of capacities and spans. Also included are hand-powered overhead traveling cranes, hand-powered and electric hoists.

Conco Engineering Works, Division of H. D. Conkey & Co.

377—Conveyors and Elevators

Bulletin 358 describes Redler *En Masse* conveyor and elevators. Features comprehensive technical and engineering data, specifications, diagrams, and application photographs. Redler conveyor elevators can be applied horizontally, around bends, on inclines, and vertically for small particle handling.

Stephens-Adamson Mfg. Co.

MECHANICAL POWER TRANSMISSION

378—Turbine Pump Drives

Bulletin 31 describes Johnson's right angle turbine pump drives, in standard and combination drive installations, in a wide range of models to meet specific requirements of prime movers and pumps. Introduces new *Redi-Torq* automatic combination drive. Illustrations, power ratings, and average efficiencies.

Johnson Gear & Manufacturing Co., Ltd.

382—AC Variable Speed Range Drives

Bulletin F-2028 tells about U.S. *Varidyne* ac system for controlling the speeds of range drives for paper, fabric, plastic, and metal applications. Explains how ac drive motors are automatically coordinated for either tension control or tensionless operation, with "in step" stop, start, and speedchanges.

U. S. Electrical Motors Inc.

379—Variable Speed Belts

Catalog 61-C features variable speed belts in wide range of sizes from ⅝" to 3" top width and nominal overall lengths from 26.4" to 170". Designed to withstand intense squeezing action of pulley sheave walls and provide smooth transmission at full power capacity. Also *Adjusta-Link* belting in link form.

Lovejoy Flexible Coupling Co.

383—High Capacity V-Belt Drives

Catalog 14295 (DH-900) describes the new Gates Super High Capacity V-Belts and Sheaves, which make possible lower cost, lighter weight, more compact multiple V-Belt drives. Catalog gives complete product descriptions, drive selection tables, and engineering specifications charts, diagrams, photographs.

Gates Rubber Co.

380—Advances in Modern Gears

A 12-page bulletin which fully describes the advantages in using hardened and precision ground gears. Various applications such as radar-drive units, rotary-wing aircraft, high speed gas-turbine drives, dredge cutter drives, marine propulsion, and others are illustrated and their advantages discussed.

Philadelphia Gear Corp.

384—Coverto-Gear Operator

Bulletin AD-2441 describes Crane's new gear operator for gate valves. *Converto-Gear* operator is a complete packaged unit requiring no valve modification for attachment. Cutaway wash drawing shows construction and operation. Series of pictures illustrate complete installation procedure. Dimensions included.

Crane Co.

381—Epicyclic Gears

Bulletin 2401 describes De Laval-Stoeckicht gears, compact and with low weight per horsepower, for high speeds and high horsepower drives. Includes planetary and star types, for speed-increasing and speed-reduction applications. Selection data, examples, dimensions, illustrations, and principles.

De Laval Steam Turbine Co.

385—Universal Joints

Bulletin CS-10 describes and illustrates the five standard sizes of bevel gear universal joints available. For remote control of valves, pumps, engines, antennae, ventilators, equipment in inaccessible locations. Operate at any angle from 0° to 135° on vertical center line, or from 0° to 360° on horizontal center line.

Condenser Service & Engrg. Co., Inc.

MECHANICAL POWER TRANSMISSION *continued*

386—Solid Shaft Gear Drives

Catalog 32 shows applications, specifications, and engineering details of right-angle solid shaft gear drives for centrifugal pumps and many industrial uses. Also describes *Redi-Torq* drive for use with auxiliary engine to automatically eliminate service interruptions due to power failure.

Johnson Gear & Mfg. Co., Ltd.

387—Variable Speed Pulleys

Catalog 61-B features line of curved-face variable speed pulleys from fractional to 25 hp at 1750 rpm. Instantly adjustable. Easily installed on new or old equipment. Also belts in sizes from A to 2X TW, single and compound drives, motor bases and *Select-O-Speed* Transmissions. NEMA frame data.

Lovejoy Flexible Coupling Co.

MEETINGS, CONVENTIONS & TRAVEL

388—Alabama Convention Spot

Grand Hotel, with its adjacent Lakewood Golf Club, each year is host to numerous corporation board meetings and sales conferences, as well as to many smaller executive and golfing groups. For those desiring complete information we have a special convention kit. Delightful location, excellent cuisine.

Grand Hotel.

392—Chicago, Illinois

Folder describes the Acres Motel located at 5600 North Lincoln Avenue on U. S. Route 41 in Chicago, Illinois. Accommodations for every taste — single rooms, double rooms, kitchenettes, and apartments. Rooms have individual temperature control. Fine restaurant, swimming pool, and TV. Close to shopping center.

The Acres Motel.

389—Minneapolis, Minnesota

Colorful booklet describes and pictures the facilities of the Pick-Nicollet hotel in Minneapolis. Ideal facilities for conventions, meetings, and trade shows. Services include PA systems, television, moving picture projection, and other special equipment in this 600 room hotel. Booklet shows modern decor.

Pick-Nicollet.

393—Point Clear, Alabama

Grand Hotel, Point Clear on Mobile Bay, Alabama, offers colorful booklet on the facilities they provide for the vacationer. An eighteen hole golf course has clubhouse with complete facilities for entertaining. Cruising, fishing, dancing, tennis, and swimming for recreation. Exquisite cuisine and flawless service.

Grand Hotel.

390—Galveston, Texas

Folder describes Hotel Galvez and Villa located less than one hour drive from Houston via super highway. Thirty mile beach, swimming pool, fishing, horseback riding, tennis and golf are offered for recreation. Completely air conditioned. Facilities of Moody Center available for conventions up to 3500 persons.

Hotel Galvez.

394—Mobile, Alabama

Folder describes Hotel Admiral Semmes located in Mobile, Alabama, the Azalea City and one of America's most interesting old cities. A warm and friendly atmosphere and accommodations offer the utmost in comfort and pleasure. Completely air conditioned, television and radio, automobile entrance.

Hotel Admiral Semmes.

391—Washington, D. C.

Hotel Washington offers relaxed living. You can drive right into the hotel, via the motor lobby entrance and private registration desk. Dress as you please, your privacy is assured. Smart cocktail lounge, sky terrace, beautifully decorated modern rooms, superb food. Heart of shopping and theatrical districts.

Hotel Washington.

395—Birmingham, Alabama

Folder describes the facilities of Hotel Thomas Jefferson in Birmingham, Alabama. Rich, but unobtrusive, decor in luxurious suites is perfect for entertaining that special client. Completely air conditioned. TV, radio. Excellent meeting rooms make this hotel Birmingham's convention headquarters. Excellent food.

Hotel Thomas Jefferson.

PIPING, VALVES & PLUMBING SUPPLIES

396—Butterfly Valves

Bulletin 90 describes Fisher-Continental rubber seated butterfly valves, designed for controlling a wide range of fluids while providing positive non-leak closure. It presents comprehensive information on construction features, operation, flow characteristics, pressure drops, specifications, and dimensions.

Fisher Governor Co.

397—Surge Relief Valves

Bulletin W-2A describes G-A Cushioned Surge Relief Valves in sizes ½" to 36", which protect water lines against excessive pressures caused by surges in the system. New bulletin W-16 describes G-A Cushioned Surge Arrestor Valves which automatically anticipate the surge before it occurs. Complete details.

Golden Anderson Valve Specialty Co.

398—Flow of Liquids

Technical Bulletin 5 contains informative data on the laws governing the flow of liquids. This brochure relates primarily to the "n" value of sewer pipe, listing suggested values of "n" for Mannings formula. Describes Manning's formula in detail. Gives list of reference books for further information.

Clay Sewer Pipe Association, Inc.

399—Emergency Safety Equipment

Catalog 360 describes Haws complete line of emergency eye/face-wash fountains and safety drench showers. Immediate first aid protection against acids, chemicals, and volatile fuels. Many models, in iron, china, stainless steel, for all industrial applications. Complete specifications and detail drawings included.

Haws Drinking Faucet Co.

400—Float-Type Liquid Drainers

Bulletin 400 describes cast iron and forged steel liquid drainers for pressure ranges to 250, 600, 1800, 3500, and 5500 psi. Drainers to 1800 psi have closed floats; to 3500 psi, spring balanced water filled open floats; to 5500 psi, solid aluminum floats, spring balanced. Specific gravities as low as 0.40.

Armstrong Machine Works.

401—Non-Corrosive Drainline

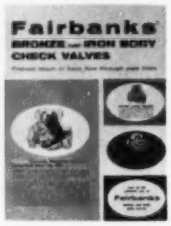
Booklet gives all necessary information on Vulcathene integrated drainline system which includes pipe, fittings, traps, and sinks. Includes recommended uses, advantages, characteristics, layout, and design. All types of drainline fittings are illustrated and give dimensional information. Accessories listed.

American Vulcathene Div.

402—Bronze Gate Valves

Bulletin E-165 describes Everlasting valves for general services. Classified index gives type, typical service, and page number. Distinctive features of Everlasting valves outline and illustrated with cutaway and exploded view. Special arrangements, duplex boiler blow-off units and parts lists included.

Everlasting Valve Co.



403—Check Valves

Bulletin V-63 describes Fairbank's bronze and iron body check valves. Provides information on applications and design features. Includes available sizes for the bronze swing and lift types with either screwed, flanged, solder or *Fairco-Braze* ends and for iron swing types. Photographs show valves, construction.

Fairbanks Co.

404—Control Valves

Bulletin 70-275 describes the BS&B Super 70 Control Valves. Multi-colored diagrams show general flow pattern and construction of globe and angle valves. Various valve actuators in photgraphs and diagrams. Each type valve illustrated in multi-color drawings, showing operation. Industrial applications.

Black, Sivalls & Bryson, Inc.

405—All-Thermoplastic Ball Valves

Bulletin TTP180 describes new all-thermoplastic ball valve offered by Tube Turns Plastics, Inc. Featuring top-entry design for quick, easy maintenance plus positive flow control of corrosive fluids. These are furnished in unplasticized polyvinyl chloride or *Penton* in sizes ½" through 2". Other products pictured.

Tube Turns Plastics, Inc.

406—Valve Maintenance Manual

Catalog M601 shows the complete line of Kennedy Underwriters' Approved Hydrants, Valves and Indicator Posts along with detailed information selection, installation and maintenance. Cross section and exploded views show components in order of construction and operation. Complete specifications.

Kennedy Valve Mfg. Co.

407—Self-Cleaning "Y" Strainers

Bulletin 171 describes McAlear No. 530 and No. 530-G self-cleaning "Y" strainers. Installed in steam, air, gas, and oil lines to protect traps, instruments, and valves. Available in bronze, semi-steel, ductile iron, cast iron, and stainless steel. Includes specifications and cutaways showing construction.

McAlear Manufacturing Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

408—Bronze Ball Valves

Bulletin DH-38 describes new forged naval bronze ball valve with *Auto-mating* seats which insure positive seating. Buna "N" seats impregnated with molybdenum disulphide insure a slippery, non-galling surface. Wiping action of ball forces out foreign matter, prevents wear.

R-P&C Valve Division, American Chain & Cable Co., Inc.

409—Continuous Weld, Seamless Pipe

Bulletin SPA-081-960 describes Yoloy pipe, the longer lasting, corrosion resistant steel pipe. For better resistance to atmospheric corrosion, soil corrosion, and chemical corrosion. Contains comparison graphs and tabular data on tests. Specifications for Yoloy steel pipe given. File tabbed for easy reference.

Youngstown Sheet and Tube Co.

410—Fabricated Pipe Fittings

Bulletin 525 illustrates standard and special fabricated fittings which help in planning piping and equipment layouts. Data includes specifications and prints on standard fittings for lightweight pipe. The bulletin also illustrates special fabrications designed to save time and labor. Suggested arrangements.

Naylor Pipe Co.

411—Pipe Drilling Machine

Bulletin W-8881 describes the Mueller CL-12 drilling machine, which drills holes to 12" in size in pipe under pressure. This machine has automatic feed with indicator, automatic travel control and can be either hand or power operated. Features are illustrated and described. Specifications included.

Mueller Co.

412—Rubber Seat Ball Valves

Catalog BA-1 describes the new Pratt rubber seat ball valve in sizes from 10" through 48". Available in 150 psi and 250 psi designs. Features, applications, construction, and dimensions. Rubber seat provides bubble-tight closure and long life. Remarkably easy to operate. Manual, cylinder motor operators.

Henry Pratt Co.

413—Forged Steel Gate Valves

Descriptive data and specifications are now available on the Chapman 960B forged steel gate valve in a new brochure. Illustrates a group of entirely new features which assure longer operating life and simplified maintenance. Among the innovations is a new "bow-legged" yoke for easier access to stuffing box.

Chapman Valve Manufacturing Co.

414—Lubricated Plug Valves

Catalog PV-6 covers the full line of Powell steel and semi-steel lubricated plug valves. Profusely illustrated, it shows and describes all available types of valves, lists pressures and sizes, and gives complete dimensions. Installation, operating, and maintenance information, and component parts lists.

Wm. Powell Co.

415—Gate and Check Valves

Catalog 57 describes Darling's line of gate valves and check valves in iron, bronze, steel, and special alloys for all types of valve application. Also included are fire hydrants and accessories for fire protection. This 244 page bound volume gives specifications, pictures, facilities, and illustrates product applications.

Darling Valve & Manufacturing Co.

416—Strainers

Bulletin SS-21C gives data on complete line of strainers for steam, air, gas, oil, and water lines. Available in semi-steel, cast steel, bronze, block steel, and new ductile (nodular) iron. For collection of dirt, scale, and other foreign matter in the line, preventing clogging and damage to systems and equipment.

Strong.

417—Glass-Lined Sewer Pipe

Folder deals with the glass-lined sewer pipe with a mechanical joint. *Amvit Glas-Glaz* pipe is available in 4-ft lengths. It is root and infiltration proof and is glass coated inside and out. The pipe has been designed for an under-the-house drain and also as a house-to-street sewer. Assembly operations shown.

American Vitrified Products Co.

418—Wedge-Lock Clay Pipe

Bulletin R-359-87 describes Robinson's *Wedge-Lock* clay pipe. Shows how it provides tighter joints to resist roots and combat infiltration in the house, in the ground, and under basement floors. Installation procedures for *Wedge-Lock* factory-made joints are illustrated. Line of fittings pictured. Applications given.

Robinson Clay Products Co.

419—River Crossing Pipe

Bulletin L115 describes American Molox Ball Joint pipe for river crossings and other submarine service. Catalog contains a detailed description of the joint, various applications and installation methods, dimension and weight tables, and assembly instructions. Photographs illustrate types of installations.

American Cast Iron Pipe Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

420—Hot and Cold Water Dispensers

Bulletin WC-20 describes and illustrates Haws dual service water coolers with hot water facility for instant coffee, tea, soups. Specifications and ratings for 4 models are shown, each dispensing 175° F. hot water at rate of 60 6-ounce cups hourly. Two models feature refrigerated compartment with ice and storage.
Haws Drinking Faucet Co.

421—Solenoid Valves

New Bulletin W-7B describes the complete line of Golden Anderson Cushioned Solenoid Operated Valves, available in sizes from ½" to 36" for lines carrying water, oil, air, and other liquids. Suggested applications, parts lists, dimensions, specifications, electrical characteristics, and operating instructions.
Golden Anderson Valve Specialty Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

422—Pipe Joints

Technical Bulletin 4, issued by the Clay Sewer Pipe Association, discusses various types of pipe joints. Important information as to general procedure included. Types of joints and jointing procedures are illustrated. Hot poured bituminous, precast bituminus, and wedge-lock joints are described in detail.
Clay Sewer Pipe Association, Inc.

423—Disc Valves

Bulletin 574 describes how, through a special Kennedy process in valve disc construction, valve service life is extended considerably. Tells of proof of service through exacting tests. Galling eliminated and no repacking required in 25,000 full cycles. Available valves listed. Cutaway and types shown.
Kennedy Valve Mfg. Co.

424—Thermoplastic Pipe Fittings

Catalog TTP219 describes full line of pipe fittings, flanges, and valves furnished by Tube Turns Plastics, Inc. in *UPVC, Penton,* polypropylene, polyethylene and other industrial thermoplastics in wide selection of types and sizes. Catalog includes complete technical section and engineering data.
Tube Turns Plastics, Inc.

425—Self-Operated Pressure Valves

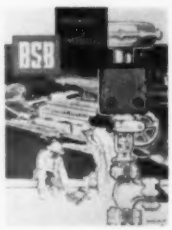
Bulletin C-20 contains descriptions, sizing, applications, and dimensions of Fisher direct-operated pressure reducing and back pressure valves. Valves are available for reduced pressure in In. W.C. to 500 psi and sizes from ¼" to 12" line. Fluids controlled include liquids, gases and steam.
Fisher Governor Co.

426—Steam-Jacketed Valves

Bulletin E-200 describes Everlasting's steam-jacketed valves ideally suited to handling different types of viscous materials. Cutaway shows construction and operation. Exploded view shows components and arrangement of parts. Includes list of features, application photographs, and side and end views.
Everlasting Valve Co.

427—Unions and Union Fittings

Bulletin D-1 describes Dart malleable iron unions and union fittings. Made with bronze to bronze seats these unions are ground to a true ball joint and guaranteed to give a drop tight seal. Dimensions given in tabular form for all sizes in all types. Cutaways show construction of each type.
Fairbanks Co.



428—Pneumatic Controllers

Bulletin 72-117 describes pneumatic controllers manufactured by Black, Sivalls & Bryson. Discusses the economics of BS&B control systems, physical features, and building a controller. Photograph shows inner working of controller pointing out the five modes of control. Various types are illustrated.
Black, Sivalls & Bryson, Inc.

429—Basket Strainers

Bulletin SM-70 Strong basket strainers which provide positive, low cost protection to valves, regulators, and other vital equipment. Cutaways show operation and construction. Line drawings are keyed to tabular dimensions. Specifications are included along with prices. Available in semi-steel and cast steel.
Strong.

430—Y-Type Pipe Strainers

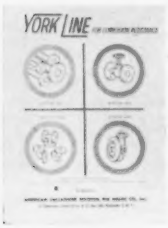
Bulletin 170 describes strainers fabricated from semi-steel, cast carbon steel, cast chrome moly WC6, forged chrome moly ASTM A-182 F22, bronze and stainless steel. Connections are screwed, flanged, butt weld, socket weld and silbraz. Different types of screens illustrated and described.
Armstrong Machine Works.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

431—Valve and Hydrant Manual

Catalog M612 provides complete description of Kennedy A.W.W.A. valves and hydrants combined with details of construction in exploded and cross section views. Also has all information necessary for installation, maintenance, inspection and repair plus detailed specifications.

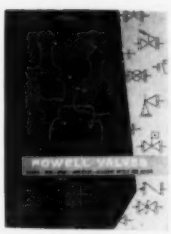
Kennedy Valve Mfg. Co.



432—Penton®-Clad Pipe and Fittings

Bulletin covering York *Penton®-Clad* steel pipe and C. I. fittings, coated ID and OD with high temperature Hercules developed plastic. Used for high temperature and corrosion-resistance process piping. Has strength of steel and the chemical resistance of *Penton®*. Continuous operation at 250°F.

American Vulcathene Div. Nalge Co.



433—Valves All Types

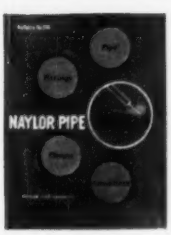
Bulletin 216 is condensed and compact catalog which describes the Powell line of bronze, iron, steel, alloy, lubricated valves, liquid level gauges and other specialties. All products listed are illustrated. Cutaways show construction details. Available sizes, pressure and temperature ratings listed.

Wm. Powell Co.

434—Butterfly Valves

Bulletin 5904 is a comprehensive 36-page catalog on Darling-Pelton rubber seated butterfly valves and operators. Catalog contains information on Darling-Pelton valves, designed in accordance with AWWA specifications for hydrostatic operating pressures up to 125 psi and velocities up to 16 feet per second.

Darling Valve & Manufacturing Co.



435—Lightweight Pipe and Fittings

New 8-page condensed catalog summarizes complete line of Naylor lightweight pipe, fittings, flanges, and connections. Lists typical applications. Includes standard specifications on pipe from 4 to 30 inches diameter, together with details on standard fittings and flanges. Covers couplings for pipelines.

Naylor Pipe Co.

436—Jointed Vitrified Clay Pipe

Jointed vitrified clay pipe known as *Amvit*, with a built-in mechanical joint made from polyvinyl chloride, is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out.

American Vitrified Products Co.

437—Block Steel Valves

Bulletin 169 describes McAlear No. 37 and No. 38 block steel valves. Outlines service features, construction, operation pressures, and operation. Both models are illustrated. Line drawing shows construction and operating principles. Installation procedures detailed. Complete specifications tabulated. Ordering data.

McAlear Manufacturing Co.

438—Bar Stock Valves

Bulletin DH-766-B gives complete information on K-P&C bar stock valves. Available in a range of metals and sizes for applications requiring close control valves capable of withstanding a wide range of working temperatures and pressures. Completely illustrated.

American Chain & Cable Co., Inc.
R-P&C Valves Division.

439—Standard Steel Pipe

Bulletin SPA-034-260 describes Buckeye and Yoloy steel electrical raceways for modern construction. Various types of conduit are illustrated. Chemical properties are given. Photographs show installation while buildings are under construction. Conform with the requirements of Underwriters Laboratories.

Youngstown Sheet and Tube Co.

440—Ball Float Traps

Bulletin SS46 describes complete line of Strong continuous flow ball float traps. Application data, list prices, detailed specifications, dimensions, cutaway drawings, capacities, and installation diagrams are included. New steel and semi-steel side-inlet models, with wide pressure-temperature limits included.

Strong.

441—Gate Valves

Bulletin W-8899 describes Mueller gate valves having the exclusive four-point wedging mechanism complying with AWWA specifications. In addition to gate valves, the bulletin also describes cut-in sleeves and valves, inserting valves, and tapping sleeves and valves. Line drawings illustrate installation.

Mueller Co.

442—Ice Compartment Water Coolers

Bulletin WC-21 illustrates and details Haws Models HPCF and HBCFS refrigerated compartment electric water coolers. Each has front-opening chest with two ice trays and storage for soft drinks, and pharmaceuticals. Door has key-lock to permit access control. HPCF's pressure bubbler, HBCFS is bottle-type.

Haws Drinking Faucet Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

443—Pipe Joint for Liquid Service

Bulletin L126 describes American's *Fastite* Joint pipe for water, sewage, and other liquid service. Affords lower joint cost and time saving advantages. Assembly methods are outlined and illustrated. Includes tables of working pressures and recommended deflections. Typical installations are pictured.

American Cast Iron Pipe Co.

444—Cyclone Strainers

Bulletin S-1 describes the new Pratt cyclone strainer utilizing centrifugal force to keep larger particles from clogging basket. Unique design allows low-cost installation, and provides for "add-on" elements for plant expansion. Furnished complete with headers for any reasonable pressure-drop. Features and construction.

Henry Pratt Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

445—Fine-Screw Strainers

Bulletin S-206 describes the Yarway low-pressure drop, in-line strainers for pressures to 1500 psi. Includes complete specifications, dimensions, weights, prices, cross-sectional views, and selection tables. Covers strainers in five different body materials to 4-inch sizes with removable screens of Monel metal.

Yarnall-Waring Co.

446—Jacketed Pipe and Fittings

Bulletin J-57 describes pipe, welded steel fittings, spring loaded plug valves, and valves all jacked, manufactured by Hetherington & Berner Inc. Different types of valves and fittings are illustrated together with cutaway photographs showing construction and operation. Also jacketed pumps and flexible hose.

Hetherington & Berner Inc.

447—Plumber's Brass Goods

Catalog PB-60 lists McDonald's complete line of plumber's brass goods. Each item is fully described and illustrated. Specifications include catalog number, size, weight, and pieces per carton. Includes valves of all kinds, sink sprays, copper tube fittings, gas cocks, steam stops, fill caps, and vents. Trade customs.

A. Y. McDonald Mfg. Co.

448—Tilting Disc Check Valves

Catalog 30-C describes Chapman's Tilting Disc Check Valves as differing radically from standard type check valves, eliminating slamming and wear of moving parts and substantially reducing friction losses. Made in iron, bronze and steel, models are available for working pressures to 6000 psi, sizes to 72" dia.

Chapman Valve Manufacturing Co.

449—Wedge-Lock Type "O" Joint

New Robinson *Wedge-Lock* Type "O" joint for vitrified clay pipe is described and illustrated in folder R-460-110. Solves many water handling problems. Specifications of the new joint as well as testing methods used are detailed in the folder. Suggestions on specifying Type "O" joint also included.

Robinson Clay Product Co.

450—Pipe and Vessel Covering

Catalogue 157-51 covers uses of *Styrofoam*, Dow foamed polystyrene, in refrigerated piping, valves and fittings and vessels. Photographs and line drawings show installation and application. Specifications and formula for thicknesses are listed. Includes manufacturers and sales office locations.

Dow Chemical Co.

451—Valve Controls

Bulletin 1-60 fully describes the most popular type of *Limitorque* Valve Operator. What *Limitorque* is, does, and operates are clearly explained. Also, contained are complete dimensions and parts lists with drawings. Preferred mounting positions, operating tips and supplementary equipment illustrated.

Philadelphia Gear Corp.

452—Insulated Piping Systems

The new edition of the Ric-wiL product catalog covers construction features for prefabricated, insulated piping systems for steam, hot water, oil, or refrigeration distribution lines. Types of systems covered include *Hel-cor, Uniline, Type* J, and cast iron. Prefabricated accessories are also included.

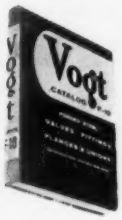
Ric-wiL, Inc.

453—Precision Control Valves

Catalog A243 describes all types of precision control valves manufactured by the Kohler Co. Cutaways and exploded views show construction and operation of various types of valves. Sizes and engineering data in table form is included. The many valve applications are listed. Branch sales office addresses given.

Kohler Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*



454—Steel Valves and Fittings

Henry Vogt Machine Company has just released its new catalog of forged steel valves, fittings, flanges, and unions. Its 432 thumb indexed pages feature new types an dtrims to meet severe fiuid and gas handling duties at all temperatures and pressures. A permanent book containing complete information.

Henry Vogt Machine Co.

455—Complete Power Piping Service

Brochure describes services and manufacturing facilities of M. W. Kellogg Company. Kellogg will design, supply, and erect quality pressure piping as specified by you. Booklet outlines services in detail. Their modern equipment effect economies. Photographs show operation and fabrication methods.

M. W. Kellogg Co.

456—Gate Valves

Bulletin VC3-H describes a new gate valve that can be throttled like a globe. Tables showing rating, pressure, operating temperatures, and many uses are included. Available in both solder end and threaded end. The size range is listed along with dimensions and cutaways. Air, water, oil and gas.

NIBCO Inc.

457—Joint Compound

Bulletin 48 describes a sulfur base compound of the melt and pour type. Used for jointing cast iron, terra cotta, and vitrified pipe and also with acid proof brick for corrosion proof construction. Resists water, acids and alkalies. Lists advantages and industrial uses. Includes instruction for pipe jointing.

Sauereisen Cements Co.

458—Pipe Fabrication

Bulletin AD-2451 describes Crane services for the prefabrication of pipe assemblies. Capacity to fabricate 400 tons of piping a month with complete stocks ranging from ⅜" to 24" O.D. Facilities illustrated pictorially. Application photographs show power generation, petroleum refining, and process industries.

Crane Co.

459—Snow Melting Systems

"Steel Pipe Snow Melting and Ice Removal Systems," 32 pages, presents the case for snow melting systems and shows typical installations in commercial and industrial locations. Design data is complete with information on anti-freeze mixtures, sizes, and spacing.

Committee of Steel Pipe Producers, American Iron and Steel Institute.

460—Complete Plastic Piping Systems

Newest catalog from Kraloy/Chemtrol Co. describes complete line of non-corrosive plastic pipe, fitings, valves and pumps. Engineering data augment comprehensive coverage of products and services offered. Corrosion resistance data covers PVC I, PVC II, ABS, Penton, Polyethylene, Viton, and Buna-N.

Kraloy/Chemtrol Co.

461—*Saf-T-Seal* Gate Valves

A completely new line of slab gate type ASA Gate Valves from W-K-M is described in Bulletin WS-1061. Using a pressure-actuated sealing principle entirely, the *Saf-T-Seal* Valve features through-conduit, full bore; steel seats with *Teflon* inserts; easy operation. Sizes, 2" through 36"; pressures to ASA 900.

W-K-M division of ACF Industries, Inc.

462—Stainless Steel Fittings

This 22-page catalog explains how Speedline stainless steel fittings reduce piping costs by allowing the designer to take advantage of the new and more economical schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates industrial applications.

Speedline Fittings Division, Horace T. Potts Co.

463—Cast Iron Pipe

Catalog of cast iron pipe, fittings, fire hydrants, water works gate valves. Specifications, dimensions, and weights of bell and spigot, mechanical joint, flanged pipe, and fittings covered. Mathews Modernized, Mathews Flanged Barrel, and R. D. Wood Swivel Joint fire hydrants described. Also Wood gate valves.

R. D. Wood Co.

464—Drinking Water Coolers

Bulletin T-495 gives specifications, capacity ratings, and selection data on line of electric drinking water coolers. Models from 3 to 22 gph. Air cooled or water cooled condensing units. Wall mounted or wall flush types, explosion-proof, freezer-compartment, all stainless steel, hot and cold, remote models.

Temprite Products Corp.

465—Fibre Pipe and Fittings

Catalog No. 307 describes Orangeburg pipe and fittings and Orangeburg perforated pipe. Outlined are their many uses and advantages for underground non-pressure applications outside the dwelling. Pipe, fittings, and adapters are illustrated and accompanied by specifications.

Orangeburg Manufacturing Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

466—Welded Steel Pipe

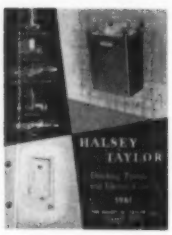
Catalog 8558 describes Armco Welded Steel Pipe for industrial uses. Among subjects covered are specifications, linings and coatings, fittings, joints, pressure design data, and flow of fluids. Data tables and designs included. All subjects covered are illustrated with photographs and line drawings.

Armco Drainage & Metal Products, Inc.

467—Valve Attenuators

Bulletin K-52 describes *Pneumavalve* by Connor Engineering Corporation, total constant volume high velocity valve attenuators. Includes features, controls, operation, performance data, dimensions, ratings, and specifications. Components of various assemblies detailed and illustrated. Drawings show dimensions.

Connor Engineering Corp.



468—Drinking Fountains and Coolers

Catalog describes Halsey W. Taylor's drinking fountains, electric water coolers, counter top fountains, and pedestal fountains. Illustration of each model is accompanied by dimensional line drawing. Construction features are described and illustrated. Types of fountain heads and projectors included.

Halsey W. Taylor Co.

469—Normal-Impact PVC Plastic Pipe

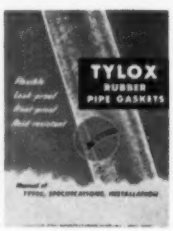
Bulletin describes rigid "K&M" *Normal-Impact* PVC plastic pipe, for use on farms, homes, industry, and municipalities. Offers strength, light weight, economy, and durability. NSF-approved for carrying water. Also designed for conveyance of acids, alkalies, and other corrosive liquids.

Keasbey & Mattison Co.

470—Duo-Chek Check Valves

Bulletin 4161 describes *Duo-Chek* valve which performs all regular check valve duties, yet is smaller, lighter, easier to install. Space occupied as low as 4% and weight less than 10% of conventional check valve. No slam or water hammer. Sizes 2″ to 48″, ASA series 125 to 2500. Steel, stainless, aluminum, and bronze.

Mission Valve and Pump Co.



471—Rubber Sewer Pipe Joints

A 16-page technical manual in color fully describes, illustrates, and diagrams the full line of *Tylox*® rubber and neoprene gaskets for coupling any type of concrete sewer pipe. *Tylox*® physical properties, guides for writing rubber joint specifications, and tips on *Tylox*®-jointed pipe installation are also included.

Hamilton Kent Manufacturing Co.

PLANT SITES

472—Industrial Opportunities

A colorful new presentation of Colorado's industrial opportunities. Included are booklets on manufacturing, power, raw materials and resources, transportation, markets and labor, Colorado living, industrial site locations, state highway map, and full color recreation booklet. Up-to-the-minute data in portfolio form.

Colorado Department of Development.

473—New York Plant Locations

Bulletin "At Your Command" describes plant location services offered by the Niagara Mohawk Power Corporation. Services include inventory of available industrial sites and buildings. Offer detailed analysis of community facilities, taxes, government, and other important characteristics. No cost or obligation.

Niagara Mohawk Power Corp.

474—Industrial Facilities

Comprehensive booklet on industrial facilities available in Upstate New York. Describes availability of produce markets, general labor supply, and availability of skilled supervisory and professional labor. Offers world market via waterways. Graphs show manufacturing and small business expansion.

Niagara Mohawk Power Corp.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

POWER EQUIPMENT & FUELS

475—Burners and Boilers

Check-list IC-169 in book form gives locations of *Hev-E-Oil* Burners, *Hev-E-Duty* Gas Burners, and New Highlander Automatic Boiler-Burners in use in 1961. The list is categorized into types of installations, geographical locations in the U. S. and Canada. Product information is also included.

Industrial Combustion, Inc.

476—Incinerator Stoker

The Combustion Engineering incinerator stoker is completely described in Catalog IS-1. Various schematic drawings of several designs of units are featured. Firing methods, performance records and the many advantages of incineration are covered in detail. Closeup photographs show grate surface design.

Combustion Engineering, Inc.

477—Oil and/or Gas-Fired Boilers

Bulletin 1260 describes and illustrates *Powermaster* Model 3 line. Includes gas, oil, and combination gas/oil models, a new specially designed hot water boiler, and the new steam atomizing principle for use with No. 6 oil. Ratings and dimensions of all sizes in line are included. Cutaway shows operation.

Orr & Sembower, Inc.

478—Coal-Fired Packaged Boilers

Bulletin PG-59-4 describes semi-automatic stoker-fired packaged boilers now available in standard sizes of 43,000, 50,000 and 63,000 lb of steam per hour. Performance characteristics are given in graph and table form. Photographs and line drawings of the water-tube units show installation and construction details.

Foster Wheeler Corp.

479—Packaged Hot Water Boilers

Type CC Superior Packaged Hot Water Boilers firing gas, oil, or both are described in this catalog. Capacities from 670,000 to 11,720,000 Btu/hr and equipped with newly developed *Venturi-action* mixing tube, Type CC has four passes, 5 sq ft of heating surface per bhp, and induced draft.

Superior Combustion Industries Inc.

480—Compact Heating Boilers

Bulletin 649B, 8 page, applies to Kewanee Type C Firebox Boilers. Illustrations and description cover the sixteen sizes ranging in capacity from 1392 mBtuh to 15430 mBtuh. Data and dimension charts are included. Standard and optional equipment is outlined. Typical specification is offered.

American-Standard Industrial Division.

481—Automatic Burners

Bulletin 430B covers Peabody's completely re-designed automatic PK-54 burner for oil, gas, or combination. Pre-shipment tests are outlined. Includes advantages, design, components, adaptability, performance, control systems, and control cabinet arrangements. Completely illustrated. Area representatives listed.

Peabody Engineering Corp.

482—High Temp Water Generators

High temperature water generators for single and multi-story buildings are described in bulletin 1900 on International-LaMont *Thermojet* Generators. Bulletin explains LaMont principle of forced recirculation which permits temperature differentials to 200°F, with no thermal shock. Compact construction.

International Boiler Works Co.

483—Boiler Auxiliary Packaged Units

Bulletin 59-1 describes auxiliary package units available for boilers of 10,000 to 100,000 lbs steam per hour, steam pressure to 300 psig. Units have various combinations of deaerating feedwater heaters, boiler feed pumps, condensate surge tanks to reduce maintenance and to increase plant efficiency.

Wickes Boiler Co.

484—Geared Turbine Generators

Bulletin 4830-B1 describes Worthington's Geared Turbine Generators. Bulletin covers flexibility, design, controls, governing systems, lubrication, gears and cooling arrangements. Governing system is represented schematically. Information helps you select either single-stage or multi-stage turbines.

Worthington Corp.

485—Scotch-Type Packaged Boilers

Catalog AP-401 illustrates and describes Pacific's Scotch Type 20-60 hp packaged boilers. Contains dimensions and engineering data. Boilers are built and tested in accordance with ASME Code requirements and are complete with metal jackets, dual-fuel burners, forced draft design, one-piece flue door.

Pacific Steel Boiler Div. of Crane Co.

486—Packaged Boilers

Bulletin 200B describes the 200 Series now available from 20 to 250 hp, pressures to 250 lb. Quiet low pressure air atomizing burners for preheated or cold oils, gas burners, or combination. Text explains how water cooled combustion chamber increases tube life and eliminates ligament cracks. Dimension charts.

Johnston Brothers, Inc.

POWER EQUIPMENT & FUELS *continued*

487—Disposable Bag-Type Filters

Bulletin 7E illustrates and describes Nugent's disposable recharge bag-type filters for filtering fuel oil, lubricating oil, and a wide variety of fluids. Design, construction, and operation is explained in detail and illustrated with line drawings. Complete specifications and capacity tables in chart form.

Wm. W. Nugent & Co., Inc.

488—Continuous Blowdown System

Bulletin 8001-A features the *Total Function* automatic boiler blowdown and sampling system completely packaged and pre-engineered to handle, two, three, or four boilers 250-600 lbs working pressure, capacities up to 6,000 lbs/hr blowdown. Illustrates operating components of console and basic designs.

Fred H. Schaub Engineering Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

489—Tray Deaerators

Bulletin 4732, just issued, describes Permutit tray deaerators providing highly effective protection for boilers. Advantages are listed. Principle of operation is fully explained and illustrated with cutaways. Construction data is given and accessories are listed. Also included is the Permutit tray deaerator guarantee.

Pfaudler Permutit Inc.

490—Opposed Piston Diesel Engines

Bulletin 3800D8-S1 describes and illustrates design and construction features of Fairbanks-Morse opposed piston diesel, dual fuel, spark ignited, and turbo super charged engines for electric power generation, pump drives, marine propulsion, and other industrial and commercial uses. Cutaways show structure.

Fairbanks, Morse & Co.

491—Packaged Boilers

Cleaver-Brooks catalog AD 178 describes Cleaver-Brooks line of boilers built with unique hinged doors and fully automatic controls. Advantages of four pass, forced draft design, 5 square feet of heating surface per boiler horsepower for the CB models, 15-600 hp., oil, gas or combination fired are described.

Cleaver-Brooks Co.

492—Rotary Burners

Bulletin describes Johnson Model 53 fully automatic, metering pump rotary burners. This burner insures smooth automatic starts even after lengthy shut downs. Will fire on oil only, gas only or combination oil and gas. Available in 9 sizes from 28 hp to 560 hp. Detailed dimensions given.

S. T. Johnson Co.

493—Discharge Silencers

Data Sheet D-180 describes Maxim hi-velocity discharge silencers to handle flows to atmosphere of steam, air, or gas from safety valves, gas turbines, and turbo-charged gas engines. Installation directions on three available models. Drawings show construction. Dimensions given in tabular form.

J. B. Beaird Co., Inc., Maxim Silencers.

494—Water Gate Hoist

Catalog GH-353 describes gate hoists specifically designed to control water levels on hydro-electric power plant installations. Illustrates some typical hoists. Lists types of stationary and traveling gate hoists and the types of power dam gates for which they are applicable. Capacities from 1 to 100 tons.

D. J. Murray Manufacturing Co.

495—Induced Draft Bifurcator

Bulletin DB-44-56 describes DeBothezat's induced draft bifurcator, which provides instant, adequate draft eliminating costly stacks. Construction features are listed and illustrated with cutaway. Installation photographs, boiler code ratings, selection data, dimensional drawings.

DeBothezat Fans, Division of American Machine & Metals, Inc.

496—Forced Draft Packaged Boilers

Bulletin 749D, 16-page, features the new Kewanee Scottie Jr. forced draft package units. Ten sizes range from 20 hp to 150 hp, designed for high and low pressure, and available for light oil, gas, or combination gas/light oil. Listings are made of data and dimension charts plus typical specifications.

American-Standard Industrial Division.

497—Pressure Blowers

Bulletin 603 describes a complete line of direct drive pressure blowers specifically designed for the high pressure requirements of industrial combustion, cooling, conveying, and process systems. Compact, trouble-free units deliver from 100 to 8200 cfm at pressures ranging from 8 to 32 ounces psi.

New York Blower Co.

POWER EQUIPMENT & FUELS *continued*

498—Automatic Boiler-Burner Plant

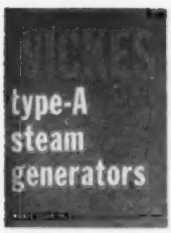
Bulletin 4 describes the simplicity, easy maintenance, adaptability, and guaranteed field performance of the Highlander, two-pass, Scotch type boiler-burner plant. A general description is illustrated in line drawings to show construction and operation. Data for each model shown in tabular form.

Industrial Combustion Inc.

499—Positive Flow Packaged Boiler

Bulletin 1275 describes Orr & Sembower's new Positive Flow Boiler. Boiler has been tested and proven by a famous consulting engineer firm. Design permits both feed injection and natural thermal circulation to augment each other thus providing maximun circulating rate and most efficient form of heat transfer.

Orr & Sembower, Inc.



500—Steam Generators

Wickes type-A steam generators, compact, efficient, shop assembled water tube boilers, are illustrated and described in catalog 56-1. It gives typical superheater arrangements for the boilers with section, plan, and side views of drainable "S", pendant, and drainable superheaters. Specifications are given.

Wickes Boiler Co.

501—Baseless Packaged Boilers

Bulletin ADJ-0025 illustrates and describes Pacific "400" Series Baseless packaged boilers for forced draft firing. Dimension and engineering data. Costly refractory and installation and maintenance eliminated. Boiler, burner, and platform are factory assembled and tested. Construction comparisons shown.

Pacific Steel Boiler Div. of Crane Co.

502—Forced-Draft Burners

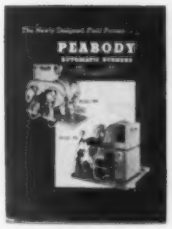
Bulletin describes compact forced-draft package unit burner. This single, coordinated, factory-tested assembly, ready for attachment to boiler, combines all necessary equipment for burning oil or gas fuels. Gives details of design and features. Diagrams are keyed to chart giving dimensions for all models.

S. T. Johnson Co.

503—Completely Packaged Boilers

Superior Packaged Boilers, both fire-tube and water-tube are described in this new catalog. Designed for capacities from 20 to 600 bhp in the fire-tube line, from 4,000 to 61,000 lb/hr in the water-tube line, and all firing gas, oil or both. Superior Packaged Boilers are backed by undivided responsibility.

Superior Combustion Industries Inc.



504—Automatic Burners

Bulletin 431 describes Peabody's newly designed, field proven automatic burners, oil, gas, or combination. Gives advantages, design, performance, and points of superiority. Components are described. Photographs of unit and control cabinet. Back cover pocket holds pages of complete specifications. Warranty explained.

Peabody Engineering Corp.

505—Hot Water Boilers

Bulletin HCC-2, a 20-page brochure, describes and illustrates the design, construction, advantages, and economies of the C-E LaMont controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison table of heat content.

Combustion Engineering, Inc.

506—Coal-Fired Packaged Boilers

Bulletin 1100 describes *Coal-Pak* automatic generators developed in conjunction with Bituminous Coal Research, Inc. Features complete combustion controls, automatic coal feed and ash removal for burning low cost bituminous coal cleanly and efficiently. Complete engineering information is given.

International Boiler Works Co.

507—Waste Heat Recovery

Bulletin WHB 59-3 describes the economic utilization of excess heat developed from diesel exhaust gases and industrial and chemical processes. Specific industrial, marine, and chemical applications of varying capacities and services are illustrated. Advantages of bare tube and extended surface designs are noted.

Foster Wheeler Corp.

508—Feed Water Deaerators

Bulletin 575-A explains continuous boiler feed water deaeration under .005 cc/liter without vent loss or adjustment, over a 10-to-1 load swing, without sodium sulphite. Illustrates operating principle and components. For boiler plants with capacities from 3,000 to 125,000 lbs/hour. Specifications are included.

Fred H. Schaub Engineering Co.

509—Square-Heat Type Boiler

Bulletin 549B, 8 page, illustrates and describes features of Kewanee Square-Heat Type R Boilers. Twelve sizes range in capacity from 243 mBtuh to 1350 mBtuh. Data and dimension charts are included. Standard and optional equipment is outlined and a typical specification is offered. Shows construction.

American-Standard Industrial Division.

POWER EQUIPMENT & FUELS *continued*

510—Mechanical Drive Turbines

Worthington's bulletin 4850-B2 covers Multi-Stage Mechanical Drive Steam Turbines up to 15,000 rpm and 50,000 hp. Cutways show single and multi-flow exhaust machines in detail. Isometric drawing illustrates automatic gland control system and explains its operation. Several control systems are diagramed.
Worthington Corp.

511—Air-Jacketed Silencers

Data Sheet D-192 describes Maxim air-jacketed silencers which not only suppress engine noise to desired levels, but also provide an economical means of ventilating engine rooms and surrounding areas. Line drawings show horizontal and vertical installations. Complete dimensions in tabular form.
J. B. Beaird Co., Inc., Maxim Silencers.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

512—Pressure Blowers

New Bulletin FI-310 provides complete factual information on Buffalo pressure blowers, Type CB and R. Job-engineered in capacities from 135 cfm to 37,500 cfm, pressures to 74" water gauge. Special features include heat slinger, inlet butterfly valve, housing drain, cleanout door and shaft seal.
Buffalo Forge Co.

513—Service-Entrance Equipment

Bulletin 601 deals with operating and safety requirements for service-entrance units. Covers manual operation, short-circuit and overload protection, arcing and single phasing. Gives equipment specifications. Includes illustrated section on operation of Pringle bolted-pressure load-break service-entrance switch.
Pringle Electrical Manufacturing Co.

514—Vibra-Grate Stokers

Catalog S-546-A describes water-cooled, vibra-grate stoker, outlining five major advantages. Stoker fires large or small boiler economically and efficiently. Operating principle outlined and construction features illustrated. Included are 16 diagrams of actual installations.
Detroit Stoker Co.,
Div. of United Industrial Corp.

515—Turbine Oil Filtering Equipment

Bulletin 14F illustrates and describes Nugent packaged turbine lube oil filtering equipment which consists of gravity type filter with water separating compartment, motor driven oil circulating pump, pressure type oil polishing filter, and sight flow indicator. Photographs and diagrams included.
William W. Nugent & Co., Inc.

516—Automatic Packaged Boilers

Bulletin 509B describes Johnston Brothers' packaged boilers. Fully automatic, factory assembled and fire tested. Oil, gas or combination oil/gas firing. Advantages given. Colorful cutaway shows operation. Firing equipment and accessories are described. Schematics show construction. Specifications, dimensions.
Johnston Brothers, Inc.

517—Diesels for Shovels/Draglines

Bulletin 125 has complete technical data on White Superior's popular Model 40 engines, designed to give dependable power and top economy for heavy construction equipment. Engines come in 6 and 8 cylinder models and are rated from 385 to 800 bhp continuous.
White Diesel Engine Div.,
White Motor Co.

518—Refuse Burners

Catalog 510 describes various methods of burning dry or wet bark, scrap wood, corn cobs, bagasse, spent coffee grounds, and other types of refuse on Detroit RotoStokers and RotoGrate Stokers. Refuse is burned separately or in combination with coal using automatic feeder systems.
Detroit Stoker Co.

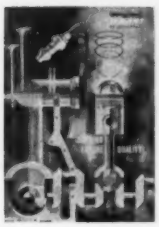
519—Blow-Off Systems

Bulletin 5700A describes heat and fuel savings possible with a Cochrane Continuous Blow-Off Heat Recovery System. Flow diagrams show installation methods. Chart included permits determining savings in Btu's per/hr when the per/hr blow-down, evaporation rate, percentage blow-off, and boiler pressure are known.
Cochrane Division, Crane Co.

520—Control of Draft

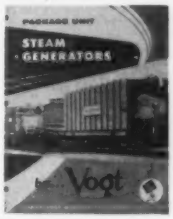
Booklet describes engineered products for draft control. Contains specifications and information for consulting engineers covering industrial heating and process ing equipment applications. Pictured are controls for solid fuels, oil, and for gas or oil/gas. Physical data in tables.
Field Control Division
Conco Engineering Works, Inc.

POWER EQUIPMENT & FUELS *continued*



521—Judging Engine Quality

Booklet 20185-DN935 is an informative handbook dealing with selection of engines. It emphasizes the features of various designs which provide top quality performance at minimum cost. Cutaways compare four and two cycle operation, multiple and single orifice injection valves important in engine selection.
Caterpillar Tractor Co.



523—Steam Generators

Bulletin PSG-3, 10 pages, presents design and construction details, tables of capacities, dimensions, and weights of package unit type steam generators. Available in three standard pressures of 175, 250, and 375 psig, the boilers are designed to be used with different types of firing and control equipment.
Henry Vogt Machine Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

524—Induced Draft Fans

Bulletin L-3 describes Lehigh's line of centrifugal induced draft fans. Covers rating tables shown at 600°F, dimension data, and construction material specifications. Recommends sizes of fans for oil, gas or coal fired boilers. Includes typical installations and photographs.
Lehigh Fan & Blower Division
Fuller Company

522—Internal Combustion Engines

Catalog EN303 describes 4-cycle, short-stroke, air-cooled internal combustion engines manufactured by Kohler Company. Each model is illustrated. General specifications, dimensions, and various applications given. Use of engines in various types of equipment are shown in photographs. Other Kohler products.
Kohler Co.

525—Forced Draft Burner Systems

Specifications for 6 sizes and 7 types of the self-contained Todd *Roto-Pac* fully automatic forced draft burner systems are given in bulletin TD60-4X. Operating on gas, oil, or combination with auotmatically fired boilers or furnaces to 3,500,000 Btu/hr., *Roto-Pac* performance is summarized.
Todd Shipyards Corp., Products Div.

PUMPS & COMPRESSORS

526—Rotary Compressors

Bulletin ACO 100.4 describes a new heavy-duty rotary compressor for general purpose services, including those requiring delivery of oil-free air, gas, or vapor. Performance coverage, capacity up to 21,000 cfm, pressure up to 250 psig. Foremost applications in chemical, petro-chemical, and heavy industries.
Fairbanks, Morse & Co.

528—Non-Clog Sewage Ejectors

Bulletin 800 provides information on specifying, selection, installing, and operating Weinman Type M-VS vertical submerged non-clog sewage ejectors for pumping drainage from low to higher level. This bulletin also includes drawings, charts, selection tables, and details of accessories for all models.
Weinman Pump Manufacturing Co.

527—Process Pumps

Bulletin 1-120 describes Byron Jackson's all purpose process pump designed for maximum flexibility. Various parts are interchangeable to meet any set of conditions. This is graphically shown with cutaways. Also shows basic combinations of mechanical construction available for each pump. Service and sales offices.
Byron Jackson Pumps, Inc.

529—Deepwell Submersible Pumps

Bulletin B1400 gives performance data and illustrates major features of Sumo high capacity 3550 rpm and 1750 rpm pumps from 600 to 3400 gpm, for industrial, commercial, and municipal water supply and booster service. Cutaways show features and construction. Specifications and special applications.
Sumo Pumps, Inc.

PUMPS & COMPRESSORS *continued*

530—L-P Gas Pumps

Catalog "H" describes the complete line of Viking LP-Gas pumps for bottle filling, fueling, bulk plant, and truck mounting applications. Capacities range from 5 to 158 gpm. Catalog includes complete dimensional data, pump specifications, and performance graphs. Includes new high speed, big truck pumps.

Viking Pump Co.

531—Vertical Turbine Pumps

Bulletin 900 completely describes the facilities of the Layne & Bowler Pump Co. The *Verti-Line* pump made today represents 50 years devoted to the design, engineering, production, and improvement of vertical turbine pumps. Typical fields where *Verti-Line* pumps are in service shown. Types of pumps pictured.

Layne & Bowler Pump Co.

532—Vertical Turbine Pump

Bulletin 1032 describes features of Johnston's "Type C" line of industrial pumps, designed to operate at heads to 1200 ft, with capacities to 12,000 gpm, and at temperatures to 600°F. Principal applications include suction booster, pipe line, power plant, refinery, and municipal booster service and bulk plant transfer.

Johnston Pump Co.

533—Packaged Gas Compressors

White Diesel's new line of medium speed, heavy duty gas compressors, matched with its Superior gas engines, are described in Bulletin 124. Of balanced-opposed design, line contains 2 and 4 cylinder models, ruggedly built for the 200-1000 bhp range.

White Diesel Engine Div.,
White Motor Co.

534—Circulating Pumps

Bulletin 1470.5 gives features, specifications and performance curves of Type CSL centrifugal pumps designed for use where quietness is a must. Motor and pump are sleeve bearing and oil lubricated. Capacities to 1000 gallons per minute, heads to 95 feet. Available with steel or cast iron base. Specifications.

Pacific Pumping Co.

535—Centrifugal Pumps

Bulletin PC-261 describes B&G's new "C" size pumps available up to 75 hp with capacities to 2000 gpm and heads to 170 ft. These pumps, with broader range of ratings, are constructed for long life and efficient operation. Cutaway shows components and construction. Selection data and dimensions.

Bell & Gossett Co.

536—Rotary Positive Blowers

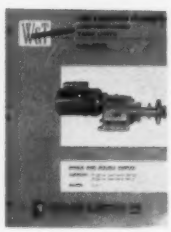
Series 88 rotary positive blowers and gas pumps are described in bulletin S88-A including dimension drawings and cutaways. Volumes up to 2200 cfm with pressures at 12 lbs continuous and 15 lbs intermittent. Standard and integral gearhead construction described in step up and step down ratio.

Sutorbilt Corp., Subsidiary of Fuller Co.

537—Manual of Pumping Problems

"How to Solve Pumping Problems," 36-page instruction manual, covers important fundamentals of estimating requirements of the average pumping job. It contains sample problems on hydraulic systems, general transfer, and pressure transfer, plus tables, charts, and other pertinent engineering data.

Roper Hydraulics, Inc.



538—Plunger Metering Pumps

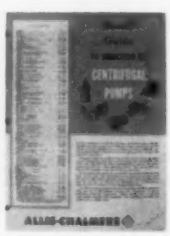
Catalog 420.100 shows W&T Series 100 Plunger Metering Pumps with single or double liquid ends. Pumps meter 0.95 to 50 gph up to 1200 psi. Stroking length may be adjusted separately for each liquid end while pump is running or stopped. Catalog gives dimension drawings and performance data.

Wallace & Tiernan Inc.

539—Split Case Centrifugal Pumps

Bulletin 106-V describes Type AJV Vertical Base Mounted Split Case Pumps manufactured by Aurora Pump Division. Capacities range to 1400 gpm and heads to 425 feet. Includes features and typical applications. Line drawing is keyed to parts list. Complete specifications.

Aurora Pump Division
New York Air Brake Co.



540—Centrifugal Pumps

Consultants interested in pumps for many different applications will find bulletin 52C6059Q a valuable reference. Whether you need a pump for handling clear liquid, corrosive or abrasive liquids, or liquids containing solids in suspension, there are 17 different types. Pumps 10 to 250,000 gpm.

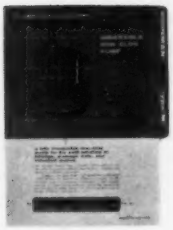
Allis-Chalmers

541—Rotary Screw-Type Pumps

De Laval IMO rotary, positive-displacement screw-type pumps are covered in bulletin 3200. Contains 40 pages of general information, specifications, dimensions, selection data, performance data, covering these unique pumps which have only three moving parts and offer quiet, reliable operation.

De Laval Steam Turbine Co.

PUMPS & COMPRESSORS *continued*



542—Immersible Non-Clog Pumps

Bulletin 1710 furnishes complete information on installation, operation, and capabilities of Weinman Type M immersible non-clog pumps for maintenance-free handling of sewage, drainage water and industrial wastes. Bulletin includes drawings, selection table, and descriptions of accessories for models.
Weinman Pump Manufacturing Co.

543—Compressed Air Filters

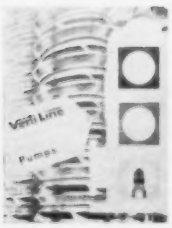
Catalog 6000 covers compressed air filters of 20 to 200 scfm capacity that remove all harmful traces of dirt, water and oil down to 2 microns or less, go months without maintenance. Describes new, exclusive scrub-and-polish action with cleaning-by-coalescence. Lists models for all needs, ¼" to 2" pipe size.
King Engineering Corp.

544—Submersible Pumps

Bulletin B-259 describes the new design of the Super-Sumo submersible pump for 4" and larger wells. Designed for economy installations, the pump features bronze and stainless steel construction for corrosion resistance, long life, and maximum pumping capacity. Sizes from 1/3 hp to 1½ hp, capacities to 1700 gph.
Sumo Pumps, Inc.

545—Rotary Pump Engineering Manual

Catalog "K" is a 36-page engineering manual on rotary pumps including six pages on rotary pump fundamentals. Sixteen pages of data on the selection of the correct pump for your application and fourteen pages of useful engineering information included. The catalog contains line drawings, graphs, and charts.
Viking Pump Co.



546—Close-Coupled Industrial Pumps

Bulletin 1100 describes Layne & Bowler's *Verti-Line* close-coupled industrial pumps. Capacities from 20 gpm to 30,000 gpm, heads to 600 psi. Features illustrated and described. Line drawing shows components, and cutaway shows construction. Head-capacity range table, material specifications, and photographs.
Layne & Bowler Pump Co.

547—Vertical Mixed Flow Pump

Bulletin 1040 gives details on newly expanded mixed flow line designed to fill the vital gap with lifts 20 to 80 ft and capacities to 150,000 gpm. Describes applications and discusses system design considerations, including sump construction and trash racks, plus standard materials of construction and dimensions.
Johnston Pump Co.

548—ADAPT-*ABLE* Pumps

Bulletin APEB 250.12 describes Fairbanks-Morse ADAPT-*ABLE* pumps, which give a wide range of clear water, non-clog, and other liquid handling modifications. Pump frame dimensions align with NEMA motor frame dimensions for ease of mounting and trouble-free operation. Various type illustrated.
Fairbanks, Morse & Co.

549—Single Suction Pumps

Bulletin 976-G gives you complete specifications on full ball bearing single suction pumps. Use includes handling saturated refrigerants and saturated liquids in air conditioning, viscous fluids in petrochemical and process industries, corrosive liquids, general water supply, and many others.
Buffalo Forge Co.

550—Pumps for Sub-Zero Fluids

Bulletin 1700-1 describes Byron Jackson's complete line of Cryogenic liquid pumps for oxygen, nitrogen, methane, and other sub-zero fluids. Capacities from 650 gpm to 15000 gpm and pressures to 2000 psi. Cutaways and line drawings show operation and construction. Also includes performance charts.
Byron Jackson Pumps, Inc.

551—Pumps and Blowers

California series rotary positive, gas pumps and vacuum pumps are described in bulletin S-59I with dimension drawings and capacity tables. For volumes up to 2480 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Many features detailed. Typical field applications. Drawing shows operation.
Sutorbilt Corp., Subsidiary of Fuller Co.

552—Rotary Pumps

Catalog 958B contains detailed illustrations of several models in each of the five major series of Roper heavy-duty industrial pumps. Capacities, dimensions, performance and application data, and illustrated major features for each series are supplied. Roper custom pumps and pump-motors are also featured.
Roper Hydraulics, Inc.

553—Mechanical Diaphragm Pumps

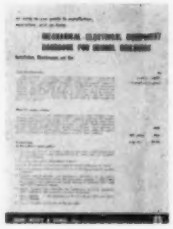
Catalog 410.015 describes W&T Mechanical Diaphragm Metering Pumps. Pumps are electrically powered, belt driven, positive displacement type, with wetted parts of corrosion-resistant materials. Single head model pumps 4-250 gals./day, 100 psig. Dual head model doubles maximum capacity. Full technical data.
Wallace & Tiernan Inc.

SPECIAL SERVICES FOR ENGINEERS

554—Specialized Consulting Service

"An extension to the professional consultant's staff, when he needs it" is the approach taken by Nalco Chemical Co. in a new 16 page, illustrated brochure on its Consulting Services Department. The range of Nalco services, among them water treatment, ion exchange, and combustion chemistry, are outlined.

Nalco Chemical Co.



555—Equipment Handbook

Bulletin describes a new book, Mechanical-Electrical Equipment Handbook. Contains sections on Heating and Ventilating, Plumbing, Sewage Disposal, Kitchen and Cafeteria Equipment, Illumination and Electrical Wiring, and Ready Reference Material. Includes main points covered by the author.

John Wiley & Sons, Inc.

STRUCTURAL MATERIALS & EQUIPMENT

556—Commercial Glass Properties

Bulletin 83 is a reference guide to the properties of over 32 selected commercial glasses. Contains 16 pages of text, tables and graphs giving an authoritative discussion of glass, its optical qualities, corrosion resistance, electrical properties, heat transmission, mechanical properties, and other properties.

Corning Glass Works.

560—Heavy-Weld Steel Grating

New 8 page catalog H760 has a unique series of charts for use in determining the exact size and type of *Heavy-Weld* Grating suitable for your particular application. Handy tables simplify the problem of specifying exactly the right grating for every load requirement.

Rockwell-Standard Corp., Grating Division.

557—Complete Structural Systems

Bulletin describes Stran-Steel's complete lightweight steel system with fully integrated cold formed structural sections. Contains information on joists, studs, channels, columns, beams, rigid frames, zee sections roof deck, ribbed decking, and curtain wall. Includes patterns, dimensions, and properties.

Stran-Steel Corp.

561—Steel and Aluminum Grating

This 16-page catalog shows the three basic types of grating construction; gives more than 30 dimensional drawings of subtypes; eight safe load tables covering steel and aluminum grating, roadway grating, and sidewalk slabs; tables on panel widths, tread widths, and floor armor. Planning layouts are given.

Borden Metal Products Co.

558—Concrete Anchoring Systems

File Folder F-259P contains literature describing features and applications of the Phillips Red Head self-drilling concrete anchor system. Graphically presents mode of installation and character of anchorage. Includes specifications, capacity ratings, test laboratory reports, fact sheets, and catalog.

Phillips Drill Co.

562—Cable Support Systems

Catalog 103 describes Chalfant cable support systems. Chalfant cable trays, racks, and troughs are designed as the most economical and efficient method of support electrical armored cable, low voltage control cables, and process tubing. Made of aluminum, galvanized steel, or aluminized steel.

Chalfant Products Co.

559—Prestressed Wire and Strand

From a pioneer in the prestressed concrete field comes a new catalog entitled "USS American Wire and Strand for Prestressed Concrete." The important phases and applications of prestressed concrete and the role American Super Tens Wire & Strand plays are shown.

American Steel & Wire Division of United States Steel Corp.

563—Steel Buildings

Catalog 530 describes a complete line of steel buildings for commerce and industry. Full color pictures show buildings available with clear span up to 120 feet. Illustrations show how steel panels combine with other exterior materials to give pleasing appearance. Construction details. Accessories listed.

Inland Steel Products Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

564—Continuous Metal Ties Report

Armour Research Foundation of Illinois Institute of Technology summary report on "Investigation of Continuous Metal Ties as a Replacement For Brick Ties In Masonry Walls." Gives relative merits of the brick header course vs. continuous wire reinforcement in tying two wythes of a brick and block masonry wall.
Dur-O-waL.

565—Large Fasteners, Accessories

Bulletin 1260, an engineering guide for selecting large fasteners and construction accessories, lists complete specifications for threaded rods, clevises, turnbuckles, coupling nuts, and sleeve nuts. Guide also describes typical applications of special fasteners. Bolt diameters are 1¾ in. and up.
Jos. Dyson & Sons, Inc.

566—Steel Welding Equipment

The consulting engineer's file folder contains literature describing the use of Nelson stud welding equipment for concrete anchoring devices and other structural fasteners. Includes data on welded stud fasteners, concrete fasteners, and powder actuated fasteners. Illustrated.
Nelson Stud Welding Division,
Gregory Industries, Inc.

567—Steel Sheet Piling

Bulletin ADUCO 25009-60 describes USS Steel Sheet Piling, which are comprised of a series of rolled sections with interlocking joints. Text clearly details piling and its uses. Diagrams show types of piling and fabricated corners, tee, and crossconnections to be used with them. Specifications, diagrams, pictures.
U. S. Steel Corp.

568—Castable Liner and Retainer

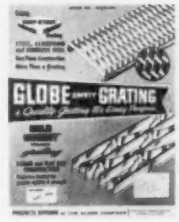
Brochure containing illustrations, drawings, data, and description of how the life of cement linings in fly ash hoppers, induced draft fans, cat crackers, reactors, and the like can now be lengthened by "Gridsteel". Installation procedure outlined. Photographs show various applications.
Irving Subway Grating Co., Inc.

569—Concrete Curing Compounds

Catalogs covering concrete curing compounds describe the 100% resin base curing compound, the white pigmented curing compound, and the wax resin base curing compound, together with their advantages, uses, quantities needed. Governmental specifications followed.
A. C. Horn Companies,
Div. Sun Chemical Corp.

570—New Ties for Masonry Walls

A new technical catalog features new adjustable anchors and ties for bonding non-modular masonry veneer to modular masonry backing. Also featured are nail-on anchors for anchoring masonry veneer to existing surfaces. Engineering drawings illustrate products use, and specifications describe application. Dimensions.
AA Wire Products Co.



571—Safety Grating

Catalog 5911 describes Globe's *Grip-Strut* safety grating available in steel, aluminum, and stainless steel. Complete information includes features, advantages, types of loading, load charts, material specifications, stair treads, installations, and special applications. Contains data on *Golden Nugget* welded grating.
Globe Co.

572—Steel Forms for Concrete

Catalog 245 describes Inland *Ribform*, a permanent steel form for concrete floor and roof slabs. *Ribform* is fabricated from high tensile steel in lengths to meet specifications. Erection is quick and easy. Available in standard, heavy-duty, and super-duty weights; black (uncoated) and galvanized steel finishes.
Inland Steel Products Co.

573—Seals and Gaskets for Masonry

Bulletin SG-61 describes Williams' seals and gaskets for masonry construction. Covers Perfect-Seal, Weathertite, Key-Seal, Neo-Seal, Accordion Seal, Hollow-Core Seals, General-Purpose Seals, and Everlastic Gaskets. Applications pictured. Information on sealing joints in precast and prefab wall panels.
Williams Seals and Gaskets Division.

574—Industrial Glassware

Bulletin 91 describes the wide range of *Vycor* brand glasses, which are suitable for applications beyond the range of any other commercially produced glasses except fused silica. Bulletin is printed in easy to read type with informative pictures, graphs and charts. Physical properties given.
Corning Glass Works.

575—Precast Concrete Elements

Catalog HMM 2180 graphically describes the unusual custom design possibilities of Marietta's complete line of precast and prestressed concrete building elements. Information on application for large or small all-concrete industrial and commercial buildings.
Marietta Concrete Division
American-Marietta Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

576—Constructional Alloy Steel

Bulletin ADUCO 01114-61 gives complete mechanical properties of United States Steel's T1 type A constructional alloy steel. Includes summary of engineering data, chemical composition, cold bend properties, availability, and range of sizes. Contains additional information for the guidance of the engineer.

U. S. Steel Corp.

577—Welded Steel Grating

New eight-page illustrated bulletin describes Gary welded steel grating and treads. Has easy-to-use table of safe loads, weights and symbols, and panel widths. Included is data on fastening devices illustrated by drawings. Information on specifying grating and tread.

Rockwell-Standard Corp., Grating Division.

578—Catch Basin Drain Gratings

Brochure contains illustrations, drawings, data, and tables for Irvico Dryway Draingrates, which give highest strength to weight ratio, lighter weight for handling, maximum water intake, require lower investment due to smaller size inlet structure required. Various applications pictured.

Irving Subway Grating Co., Inc.

579—Pre-Engineered Steel Buildings

Bulletin 60-1-257 presents Stran-Steel's new concept in pre-engineered steel buildings combining the finest in design with mass production economies. Full color illustrations show Stran styles and typical interiors. The many colors available are shown in color chart. Special features are described and illustrated.

Stran-Steel Corp.

580—Floor Gratings

Bulletin covers an improved conception for the installation of floor gratings, using the single-span divider-bar, combined with Borden's Type K reversible grating. Simplifies maintenance as well as installation. Bulletin pictures and describes installation at the new Public Service Generating Station, Linden, N. J.

Borden Metal Products Co.

581—Masonry Wall Reinforcement

Bulletin by Dur-O-waL describes wall reinforcement and *Rapid Control Joints*. Includes advantages, description, physical properties, section table, and general specifications for solid masonry wall construction. Line drawings show application. Drawings and specifications on both types of *Rapid Control Joints*.

Dur-O-waL.

582—Concrete Anchoring Systems

Bulletin F-200 describes Phillips Red Head concrete anchor system, the safest, surest way to anchor in concrete quickly. These self-drilling concrete anchors are available in all types and sizes. Each type is illustrated. Specifications in tabular form. Line drawings show installation procedures. Accessory tools shown.

Phillips Drill Co.

583—Cable and Tubing Support Systems

Chalfant Support system utilized for carrying instrumentation tubing, process tubing, piping, and control cables. Recommended for more economical, and faster installation over previous type systems. Completely pre-engineered and available with all accessories. Aluminum, galvanized steel and aluminized steel.

Chalfant Products Co.

584—Masonry Reinforcements

AA Wire Products Company, manufacturers of masonry reinforcement and masonry ties, announce that the all new 1961 Sweet's brochure is now available. This new brochure features design drawings, photographs of actual installations, and suggested guide specifications. Line drawings show various applications.

AA Wire Products Co.

585—Heavy Construction Fasteners

Bulletin 160 covers large fasteners for the heavy construction and machinery industries. Large forged standard and special purpose nuts, bolts, threaded rods, loop rods, eye bars, construction accessories, size 1¾ in. thru 12 in. bolt diameter. Illustrated with photographs of standard and special large fasteners.

Jos. Dyson & Sons, Inc.

586—Steel H-Piles

Bulletin ADUCO 25002-60 is a case-bound book which presents an extensive review of the use of USS Steel H-Piles, as well as data and illustrations of accepted practice in their design and utilization. Advantages and economics are described and illustrated. Graphs, diagrams, tables, and photographs.

U. S. Steel Corp.

587—Cable, Wiring, Tubing Supports

Two systems of support for all types of cable, wiring, and tubing are described in a 28-page illustrated catalog. Systems are engineered to be used interchangeably, depending on the weight of the load to be supported at any location. *Globetray*, the ladder-type tray, and cable-strut, the basket type, described.

Globe Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

588—Composite Building Construction

Bulletin describes composite construction. This is simply an improvement of the commonly used concrete slab and steel beam type construction. Gives history, advantages, compares new and old construction, records project saving 20 to 25 percent in structural steel.

Nelson Stud Welding Division, Gregory Industries, Inc.

589—Non-Metallic Floor-Hardeners

Bulletin 899 covers uniform size emery abrasive aggregates for hardening concrete floors. Description, advantages, usages, government specifications, quantity estimation, preparation, mixing instructions, application, finishing, and curing.

A. C. Horn Companies, Div. Sun Chemical Corp.

590—Precast Panel Seals and Gaskets

Bulletin SG-660 describes Williams seals and gaskets especially developed for use with precast concrete wall panels. The various types are designed to seal both vertical and horizontal joints under virtually any condition that might arise in either precast concrete or prefabricated metal panel construction.

Williams Seals and Gaskets Division.

591—Safe, Slip-Proof Surfaces

This bulletin describes the use of fused aluminum oxide and silicon carbide in the preparation of anti-slip surfaces on concrete floors, steps, sidewalks, concourses, and bridges. Included are methods of application. These anti-slip abrasives can also be used with epoxy resins to cover existing surfaces.

Exolon Co.

592—Acid-Proof Concrete

Data Sheets are ready on Sauereisen *Pour-Lay* cement, the acid-proof concrete for floors, tanks, and chimneys. Provides resistance to all corrosive acids, except hydrofluoric acid, and temperatures as high as 2000°F. Can be gunited, poured, cast in forms, or applied as a topping over concrete, brick, or tile.

Sauereisen Cements Co.

593—Aluminum Grating

Bulletin KA-160 describes a new kind of aluminum grating. New process permanently locks bars. No rivets, bolts, or screws. Contains illustrations and complete engineering data on grating and treads. Includes table of safe loads, weights and types, and panel width in inches. Three types of tread nosing.

Kerrigan Iron Works Co.

594—Blast Furnace Slag

Bulletin ADUCO 80034-59 is a full color brochure describing granulated blast furnace slag. Includes information on what it is and how it is made; chemical and physical properties; and how it is used. Gives tonnage used in various applications and lists the advantages of its use. Color photographs show applications.

U. S. Steel Corp.

595—Slope-Beam Buildings

Catalog 4010 describes designs possible with new *Slope-Beam* buildings. Low-profile or flat roof through simple beam inversion. In clear spans up to 80 ft. or multiple spans to almost unlimited width without need for interior roof valleys. Companion catalog 4011 with component specification data also sent.

Inland Steel Products Co.

596—Soil Compaction

Foundations on sand are described in booklet "Soil Compaction by Vibroflotation". Contents cover application and operation, soil consolidation examples, data on specifications, excavations and test pits. Detailed drawings show *Vibroflot* machine in operation and typical compaction pattern for required density.

Vibroflotation Foundation Co.

597—Duct Floors for Electrification

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development whichprovides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Steel Reinforcing Institute.

598—Construction Products

Catalog 8258 gives data on complete line of Armco products, ranging from corrugated metal pipe to construction services. References to specific literature included. Contains pictures of representative installations of various products, tables, and other useful information.

Armco Drainage & Metal Products, Inc.

599—Corrosion-Proof Cements

Bulletin 5-1 describes the complete line of Atlas corrosion-proof cements which resist attack from acids, alkalies, salts, solvents, greases, and detergents. Properties, characteristics, and recommended applications are detailed. Charts and drawings on constructing techniques and resistances are also included.

Atlas Mineral Products Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

600—Low Temperature Steels

Bulletin ADUCO 09000-60 is a booklet intended to provide engineers with information pertaining to the economical application of steels which possess desirable metallurgical characteristics for low temperature service. Gives chemical composition, design data, and other pertinent information on various kinds of steel.

U. S. Steel Corp.

601—Wire Rope and Fittings

Bulletin A-893 is a convenient, pocket-size reference book that has proven invaluable to wire rope users. It contains comprehensive data on a wide range of Roebling wire rope constructions. Includes installation information and maintenance practices.

John A. Roebling's Sons Division
The Colorado Fuel and Iron Corp.

602—Structural Tubing

Brochure STR-1 describes structural tubing for use in construction. Complete design data tables for round tubing ¼" OD up to 6" OD, squares up to 5" and rectangles with peripheries up to 20". Many application photos and details of construction shown. A handy reference when designing with tubing.

Republic Steel, Steel & Tubes Division

603—Aluminum Grating

New six-page illustrated bulletin describes the basic advantages of Gary Super *Galok* Aluminum Grating. Outlines its industrial uses for stair treads and other uses decorative and functional. Included are easy-to-use tables of safe loads and weights, panel widths, types.

Rockwell-Standard Corp.,
Grating Division.

604—Steel Joist Bridging

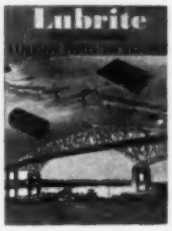
Technical Bulletin 1-BR is a report on the effect of various types of bridging on the behavior of open web steel joists, Shortspan or S-Series. Includes detailed results of three test series to determine amount of deflection and load transfer encountered with each type of bridging. Text is illustrated.

Steel Joist Institute.

605—Concrete Test Cylinders

Bulletin 400 describes Sonomold fibre forms for concrete test cylinders. Advantages of using this mold are outlined. Six inches in diameter and 12 inches high, these fibre molds are illustrated. Sampling and molding procedures for concrete test specimens described. Quality assures uniformity of tests.

Sonoco Products Co.



606—Expansion Plates and Bushings

Manual 55 contains complete information, technical data, and specifications about self-lubricating expansion plates and bushings for bridges, buildings, refinery equipment, chemical processing equipment, high temperature, missile and atomic energy applications. Fully illustrated with photographs and diagrams.

Merriman Bros., Inc., Lubrite Division.

607—*Kwick-Seal* Waterstop

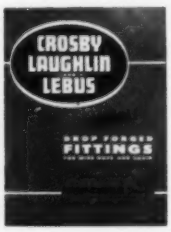
Catalog 56429 (MRG-622) describes the complete line of Gates *Kwik-Seal* Waterstop for construction joints. Catalog contains illustrations and specifications of available sizes and shapes of *Kwik-Seal* Waterstop, plus design and application information useful to engineers. Photographs show installation methods.

Gates Rubber Co.

608—Pre-Engineered Metal Buildings

Booklet 1671R gives brief background on the pre-engineered Butler Building System. Rigid frame construction permits column-free interiors with spans up to 120 feet. Shows examples of custom finished interiors and exteriors. Pictures how Butler Buildings can be expanded. Booklet is fully illustrated.

Butler Manufacturing Co.



609—Pre-Designed Forged Fittings

Catalog 950-2 describes the full line of Crosby-Laughlin drop forged fittings for wire rope and chain. Also shown and described are pre-designed forged fittings ready for installation, dimensional drawings, and engineering data given, assuring consistant quality without rejects on these OEM items.

American Hoist & Derrick Co.

610—Hot Rolled Carbon Steel

Bulletin ADUCO 27001-60 provides data pertaining to Simplified Practice Recommendation R216-46 for hot rolled carbon steel structural shapes and includes nominal dimensions, weights, properties, and dimensions for detailing. Data pertaining to other rolled products in common use included.

U. S. Steel Corp.

611—Steel Stair Treads

Tread-Grip steel stair treads combine strength of construction with safe, non-slip footing, according to four-page bulletin HTP2130. This brochure describes such features as *A. W. Algrip* nosing, electroforged and welded construction, and twisted cross bars. Included are detail drawings and dimensions.

Horace T. Potts Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

612—Reinforcing Steel

Four-page bulletin describes new Laclede high strength steel reinforcing bars for concrete. Bars conform to ASTM standards A15, A432 and A431. Chart shows stress-strain comparison. Tensile properties, physical properties, and allowable working stresses tabulated. Bars are marked to identify size and strength.
Laclede Steel Co.

613—Complete Structural Systems

Catalog describes Flintkote's *Insulrock* roof decks. Lists the advantages in its use. Gives design data, specifications, and erection procedures with detailed drawings on joist and beam construction and sub-purlin construction. Also gives data on roof deck formboard and formboard for concrete construction.
Flintkote Co., Insulrock Division.

614—"T-1" Steel

Bulletin ADUCO 01102-60 gives pertinent information on the fabrication and design of structures of "T-1" Steel. Recommended fabrication practices and fatigue considerations in the design of structures included. The text is illustrated with charts, tables, graphs, diagrams. Fabrication practices illustrated.
U. S. Steel Corp.

615—Pressure Grouting Services

Brochure PGS-0002 describes Halliburton Pressure Grouting Services including equipment, personnel, and materials for any size grouting job, a dependable and convenient method of metering, mixing, placing grouting materials continuously. Selection of special chemical grouting fluids and cement grout slurries.
Halliburton Co.

WASTE DISPOSAL EQUIPMENT

616—Adjustable Speed Sewage Pumping

Bulletin 4400-PRD-270, describing adjustable speed sewage pumping using the *Ampli-Speed* Magnetic Drive, has been made available by Electric Machinery Mfg. Co. Explains how a magnetic drive works, the economics of adjustable speed pumping, consulting engineer's roll in sewage construction.
Electric Machinery Mfg. Co.

619—Comminutor Selection Handbook

Bulletin 2129-B1 is a selection and application handbook of comminutors for sewage and industrial waste treatment. Shows sectional elevations. Gives factors to consider for comminutor selection in the modern sewage or industrial plant. Line drawings show how comminutor works. Typical channel designs shown.
Worthington Corp.

617—Small Plant Sewage Treatment

Bulletin 6692 describes Dorr-Oliver equipment for small plant sewage treatment which brings big plant results within the reach of the small community. Bulletin details the plant system; lists its many advantages; gives complete specifications. Photographs show installations and diagrams show equipment.
Dorr-Oliver, Inc.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

618—Sewage Surge Relief Valves

Bulletin SEW-1 describes G-A Cushioned Sewage Surge Relief Valves. Designed to prevent damage from overpressure in sewage lines, this new valve opens immediately and automatically when the line pressure exceeds a predetermined setting. Installation data, operational drawings, and dimensions.
Golden Anderson Valve Specialty Co.

620—High Capacity Aerator

Bulletin 7316 describes the D-O Aerator for application in both municipal sewage and industrial waste treatment plants. Can be adapted to a variety of tank sizes and is readily incorporated into existing tanks. Cutaways show aerators installed in round tank as well as in rectangular tank. Diagrams show flow.
Dorr-Oliver, Inc.

WASTE DISPOSAL EQUIPMENT *continued*

621—Packaged Sewage Pump Stations

A new 8-page bulletin contains a descriptive and well illustrated story of the *Tex-Quad* rectangular-shaped packaged pump station. Operating features, design improvements, dimensional drawings, and a list of variable capacity pump benefits are incorporated in the brochure. The company's other products listed.

Tex-Vit Manufacturing Co.

622—Sewage Lift Stations

Bulletin EJ-60 describes the *Elliptо-Ject* packaged pneumatic sewage lift station manufactured by Tex-Vit Manufacturing Company. A simplex unit available in 20 to 200 gpm, it features exclusive shell-within-shell design. Bulletin provides engineering data, specifications, and dimensional drawings.

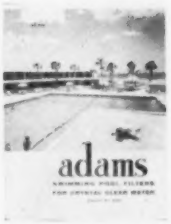
Tex-Vit Manufacturing Co.

WATER TREATMENT EQUIPMENT

623—Aerators

Bulletin 5917 describes General Filter aerators for the oxidizing of iron and removal of gases from water. The process of aeration is explained. Four types of aerators are listed with data given. Pictures of actual installations of various sizes and locations are featured. Complete specifications.

General Filter Co.



627—Swimming Pool Filters

Bulletin 626 describes Adams' vertical pressure filter aid type filters. It is complete with installation photographs, sample filter plant, layouts, and operational diagrams of Adams' exclusive *High Dome* back wash principle. Typical engineering specifications for proposing filtration equipment.

R. P. Adams Co., Inc.

624—Automatic Water Softeners

Bulletin 400A describes automatic water softeners for heavy duty service. Complete specifications are listed for 17 stock models, with installation diagrams and operation information included. Stock models in capacities up to 1.5 million grains, single unit; 3 million grains, twin unit. Flow rates are up to 175 gpm.

Bruner Corp.

628—Brinemakers

Bulletin B160A describes Morton's Model E Series brinemakers using the exclusive Morton *Fluitron*. Function, performance data, installation procedures, and operating instructions are included in this bulletin. Line drawing shows construction and operation. Component parts shown and named. Product photographs.

Morton Salt Co.

625—Water Treatment Equipment

Bulletin 615 is a booklet on water treating equipment describing manual and automatic zeolite softeners, mixed-bed and multi-column deionizers, dealkalizers, ion exchangers, filters, purifiers, aerators, and degasitors. Also covers spray and tray type deaerating heaters and water treating chemicals.

Elgin Softener Corp.

629—Custom and Standard Filters

Bulletin 2204R gives brief descriptions, capacities, filter areas, and physical dimensions on some of their standard horizontal and vertical plate filters. The operation of the different types of filters is capsuled and recommendations are given on particular models for different products. Cutaways show construction.

Sparkler Manufacturing Co.

626—High-Flow-Rate Clarifiers

Bulletin CL-158 describes the *Illco-Way* continuous high-flow-rate clarifier, an upflow coagulator design that is adaptable to a wide variety of water and waste treatment applications, including lime-soda dealkalization, removal of iron, color, turbidity, organics, silica, and chemical waste treatment.

Illinois Water Treatment Co.

630—Automatic Gravity-Filter

Bulletin 4351B describes the Permutit automatic valveless gravity filter. Operates automatically without a single valve, agitator, pump, flow controller, or even an attendant operator. Applications, operation, flow and wash rates, installation. Schematics show operation of industrial and municipal filters.

Pfaudler Permutit Co.

Consulting Engineer Directory of Advertisers' Literature - - - May 1961

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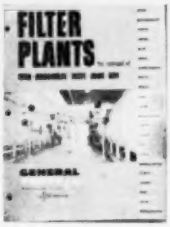
WATER TREATMENT EQUIPMENT *continued*



631—Filter Plants

Filter plants for the removal of iron, manganese, taste, odor, and gas are described in a new General Filter bulletin. Various problems are listed and answers given. Four basic treatment methods are described and graphically shown in drawings. Actual installations in all parts of the country are shown.

General Filter Co.

632—Commercial Water Softeners

Bulletin 2-368 covers the specification and installation of package-type zeolite water softeners for commercial applications. Both manual and automatic models are listed with softening capacities ranging from 150,000 thru 900,000 grains. Twin models range up to 1,800,000 grains with flow rates up to 200 gpm.

Bruner Corp.

633—Water Filtration Equipment

Bulletin 804 describes new diatomite filter. Elements of woven wire and stainless steel coil support diatomite filter media and provide unrestricted flow. "Breather" action of elements cause instant release of spent diatomite and swirl flushout assures its complete removal. Sand filters also described.

Elgin Softener Corp.

634—Cartridge De-Ionizers

Operating on the same principle as large mixed-bed de-ionizers used in power plants and for process water supplies, these cartridge de-ionizers are designed to furnish small quantities of purified water for laboratories and pilot plant applications. Cartridges and installations illustrated. Prices are included.

Illinois Water Treatment Co.

635—Potable Water Filtration

Bulletin 240 is a case history report of how Peru, N. Y., gained an additional water supply by installing an Adams diatomite filtration plant. Prior to this installation, Peru suffered severe water shortages during dry and stormy periods. Made the turbid Ausable River water crystal clear for consumption.

R. P. Adams Co., Inc.

636—Leveltrol System

Bulletin B659P describes a system for wet storage brinemaking which proportionately replaces water as brine is withdrawn. Permits accurate salt inventory; prevents overflow loss; eliminates corrosion of moving parts. Line drawings show different types of assemblies for different brine-use systems.

Morton Salt Co.

637—Municipal Water Works Filter

Bulletin 580R outlines the Model RJ diatomite filter, designed for water works filtration. Contains information on performance, construction, and operation. General specifications and a size chart gives filter area, pipe connections, floor area, and flow rates. Photograph shows filter with line drawings of features.

Sparkler Manufacturing Co.

638—Complete Water Services

Bulletin 10 outlines the complete water services offered by Layne & Bowler. Gives general facts and pertinent information on water well systems, drilling, and allied water services. Included is data on equipment for municipalities, industry, and agriculture. Lists pumps for every application. Associates listed.

Layne & Bowler, Inc.

639—Sodium Zeolite Water Softeners

Bulletin 4520-E describes Cochrane water softeners with the hydromatic single control valve. Complete explanation includes flow rates, operating cycle, softening capacity, steps of operation, and details of construction. Cutaway show components and typical arrangement. Photographs of typical installations.

Cochrane Corp.

640—Ion Exchange Resins

Bulletin Z-5 (2nd edition) is a sixty page handbook for men who are responsible for water supplies. Included within is basic data on ways of conditioning water with Nalcite Ion Exchangers, and straight forward explanations on how you can figure costs and results using the various methods.

Nalco Chemical Co.

641—Surface Aerators

Bulletin 6620-A describes Infilco's new *Vortair*, a mechanical type of surface aerator. Discusses oxygen input efficiency and power savings. Gives complete specifications and installation dimensions for 15 models in tabular form. Applications are outlined. Photographs show installations and operation.

Infilco Inc.

642—Water Works Brass Goods

The water works brass goods bulletin W-500 illustrates and describes McDonald water service products. Included are curb stops, corporation stops, goosenecks, meter stops and couplings, service pipe couplings, and extension service boxes. Each product offered is pictured with description and specifications.

A. Y. McDonald Mfg. Co.

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